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THESIS

THE EFFECT OF FORMAL TRAINING
ON CONTRACT-CONSTRUCTION COST GROWTH

by

Mark D. Claussen

March 1987

Thesis Advisor:

Ronald A. Weitzman

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responsibility for training to the Engineering Field Divisions; (4) Develop a Personal Qualification Standard similar to that established for the Contract Authority Warranting Program.

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The Effect of Formal Training
On Contract-Construction Cost Growth

by

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Lieutenant, Civil Engineer Corps, United States Navy
B.S., United States Naval Academy, 1977

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

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ABSTRACT

Naval junior officer contract-construction administrators work with civilian contractors who are experienced professionals in a competitive industry where the favored tool is a bull dozer. Increased construction cost resulting from on-the-job "learning" experiences with these contractors is a luxury the Navy can no longer afford. This study examines the results of a survey questionnaire that was distributed to all junior officers currently serving as contract-construction administrators to determine their attitudes and beliefs regarding formal training and to solicit training suggestions. The study concluded that (1) The Naval Facilities Engineering Command does not have a formal training policy for contract administrators, (2) Less than 50% of all construction offices have a training program, (3) Formal training is a controllable variable that significantly reduces contract cost growth. Recommendations include: (1) NAVFAC expand the basic Contract Construction Administration and Management course, (2) NAVFAC issue a policy statement regarding mandatory completion of the contract modifications course, (3) Shift the funding responsibility for training to the Engineering Field Divisions, (4) Develop a Personal Qualification Standard similar to that established for the Contract Authority Warranting Program.

TABLE OF CONTENTS

I	INTRODUCTION-----	8
	A. PROBLEM DESCRIPTION-----	8
	B. THESIS OBJECTIVES-----	9
	C. SCOPE OF THE STUDY-----	10
	D. ASSUMPTIONS AND LIMITATIONS-----	11
II	ANALYSIS OF THE PROBLEM-----	13
	A. THE RESEARCH QUESTION-----	13
	B. RESEARCH METHODOLOGY-----	14
	1. Literature Search-----	14
	2. The Survey Questionnaire-----	14
	a. Purpose-----	15
	b. Design-----	15
	c. Distribution-----	16
	3. The Personal Interview-----	17
	C. ANALYSIS METHODOLOGY-----	17
III	PRESENTATION OF DATA COLLECTED-----	19
	A. SURVEY RETURN RATE-----	21
	B. CURRENT CONTRACT-ADMINISTRATION DATA-----	21
	1. Level of Formal Training-----	21
	2. Dollar Value of Contracts as Reported by Groups-----	26
	3. Contract Cost Growth Data-----	28
	4. Change-Order Administration as a Time Consuming Activity-----	31

5	Constructability Reviews-----	34
C	CHANGE-ORDER COMPONENT ANALYSIS-----	36
D	COST ESTIMATION-----	41
E	IMPACT OF TRAINING ON CONTRACT COST GROWTH-----	48
F	TRAINING COURSE RECOMMENDATIONS-----	52
G	SUMMARY-----	55
IV	DATA ANALYSIS/INTERPRETATION-----	56
A	THE RELATIONSHIP BETWEEN CHANGE-ORDER RATES AND THE TIME DEVOTED TO CHANGE-ORDER ADMINISTRATION-----	57
B	THE INFLUENCE OF TRAINING AND EXPERIENCE ON CONTRACT COST GROWTH-----	60
C	ANALYSIS OF THE SUB-AREAS OF INVESTIGATION-----	62
1	Basic Contract-Construction-Administration-and- Management Course-----	62
2	Time Devoted to Change-Order Management-----	65
3	Sequence of Course Attendance-----	65
D	EXISTING NAVFAC TRAINING POLICY-----	66
E	COST-BENEFIT ANALYSIS-----	66
F	SUMMARY	
V	CONCLUSIONS AND RECOMMENDATIONS-----	69
A	CONCLUSIONS-----	69
B	SHORT-TERM RECOMMENDATIONS-----	70
C	LONG-TERM RECOMMENDATIONS-----	72
APPENDIX A:	CHANGE-ORDER QUESTIONNAIRE-----	74
APPENDIX B:	ACRONYMS AND DEFINITIONS-----	80
APPENDIX C:	SECTION 1.4.1-1.4.9 OF NAVFAC P-68-----	82

APPENDIX D: COURSE TOPICS-----	92
LIST OF REFERENCES-----	93
INITIAL DISTRIBUTION LIST-----	94

I. INTRODUCTION

A. PROBLEM DESCRIPTION

A change-order on a contract construction project involves a great amount of time and effort on the part of the contract administrator to fully identify, inspect, estimate, negotiate, and document the changed condition. Every additional minute devoted to change-order administration is a minute removed from the administrator's efforts to avoid cost growth through constructability reviews of pending construction projects and increased attention to quality construction through inspection techniques directed at contractor compliance with existing contract plans and specifications.

All Civil Engineer Corps (CEC) junior officers with orders detailing them as Assistant Resident Officers in Charge of Construction (AROICC) attend a basic construction contract administration and management course taught at the Civil Engineers Officer Basic School at Port Hueneme CA. This one-week course is general in scope and represents the sum total of formal training available to the AROICC prior to assuming duties as a contract construction manager. Additional courses available to the ROICC after assuming the duties of contract construction management include:

- Construction Contract Modifications (Change-Orders)
- Negotiation Workshops
- Contract Law
- Construction Cost Estimation

The immediate impact of this approach to management preparation is extended learning curves associated with on-the-job training and increased

construction costs to the government. The intervening period between the basic course and additional training opportunities (if any) is filled with inefficiency, error, and inconsistency in individual construction contract administration.

The civilian contractors with which these officers negotiate are experienced professionals in a very competitive industry where the favored tool is a bull dozer. The scarcity of construction funds has created an environment where increased construction costs resulting from on-the-job "learning" experiences with these contractors are a luxury the Navy can no longer afford.

6. THESIS OBJECTIVES

The two primary objectives of this thesis are:

- (1) To document and analyze the relationship that exists between the cost growth inherent in Naval contract construction projects and the contract administration training junior officers in the Civil Engineer Corps receive prior to assuming the duties as a Resident or Assistant Resident Officer in Charge of Construction (ROICC & AROICC).
- (2) To make recommendations concerning the current training policy of the Naval Facilities Engineering Command (NAVFAC) and to communicate the specifics of the analysis to those in policy-making positions in the NAVFAC contract administration organization.

To identify the relationship stated in the first objective, relevant data

was sought. Literature search and personal interviews indicated that no such data was presently available. The need to generate the required data through the NAVFAC contract administration organization became evident. The field personnel have all the experience in controlling contract cost growth, so a survey questionnaire was chosen as the vehicle to collect the needed data. This survey questionnaire has two intentions in mind:

- (1) To determine the current level of formal training held by field contract administration personnel and the impact of this training on construction contract cost growth.
- (2) To solicit suggestions about what training subjects or courses are most important to the contract administrator and whether they should be taught before or during a contract administration assignment.

From an analysis of the data base generated by the survey questionnaire, satisfaction of these two objectives will be possible.

C. SCOPE OF THE STUDY

The responsibilities and duties of junior officers who administer NAVFAC construction contracts are many and varied. This study focuses on the impact that formal training in various areas of contract administration has on the ability of these personnel to efficiently carry out their duties.

The research and survey questionnaire used in this study has been directed to field engineering personnel. These are the Engineering Facilities Division (EFD) construction division and ROICC office administrators who are familiar with day to day construction activities and whose actions

favorably or unfavorably have a direct impact on contract construction cost growth.

3. ASSUMPTIONS AND LIMITATIONS

The principal assumption made in this study is that all engineering field divisions and offices of the Officers in Charge of Construction (OICC's) are guided by the Contracting Manual NAVFAC P-68. Portions of the P-68 that address training requirements as they relate to contracting officers are included in Appendix C.

It has been assumed that readers of this thesis command a general knowledge and familiarity with NAVFAC construction contracting. To accommodate those who do not possess this knowledge, the appendices includes discussion of several background areas. Appendix B contains a list of acronyms and definitions of terms frequently used. Appendix C contains NAVFAC training requirements as applied to contracting officers.

The use of data obtained from a survey questionnaire as the major input for a study involves several inherent limitations. Initially, the preparation and form of the questionnaire are subject to the author's judgment, bias and the limitations of semantics. The use of the questionnaire as the primary medium does not allow for two-way communication during its completion by participants. Survey results tabulation is also susceptible to similar type problems. The researcher's bias could also be a factor in the interpretation and tabulation of response. The subjective judgement required in the evaluation of answers to free form questions is one example. Once compiled, the results stand the chance of misinterpretation. One must guard

against making causal connections where associations or relationships are merely indicated. In spite of these limitations, a survey questionnaire offers a relatively economical, efficient and accurate means of gathering data from a large number of participants. Accordingly, the survey results in this study should be evaluated with both the survey method's advantages and limitations in mind.

II. ANALYSIS OF THE PROBLEM

To facilitate analysis of the effect of management training on contract-construction cost growth, the first thesis objective was translated into a basic research question. This question forms the framework for gathering of research data used in the analysis performed and discussed in Chapter III.

A. THE RESEARCH QUESTION

The primary research question is: "Does there exist a relationship between the basic and specialized training received by ROICC's and AROICC's prior to and during their assignments as contract administrators and the cost growth of navy contract-construction projects"? This general research question was broken down into the following five subareas of investigation:

1. Does the basic one-week Construction Contract Administration and Management course adequately prepare the junior officer for management of construction contract cost growth?
2. What percentage of management's effort in contract construction administration is devoted to change-order administration?
3. Does the existing training policy of NAVFAC target the individuals who have the greatest impact on contract construction cost growth?
4. What contract administration courses should be taught to the contract administrator before assignment as a ROICC or AROICC?

5. What contract administration courses should be taught to contract administrators during their assignment as a ROICC or AROICC.

3. RESEARCH METHODOLOGY

Three different types of research in gathering the information needed here were used: literature search, mail and telephone survey questionnaire and personal interview.

1. Literature Search

A detailed literature search was made of government reference information in the general subject areas of construction contracts, construction-contract change-orders, and management training. All Department of Defense (DOD) and NAVFAC directives concerning training and contracting-officer warranting requirements were examined. The Civil Engineer Corps Officer School (CECOS) contract administration publications were investigated along with Engineering Field Division (EFD) instructions concerning change-orders and training. The bibliography at the end of this study contains the relevant reference materials available concerning the training of contract administrators.

2. The Survey Questionnaire

The major form of research used to gather data to answer the research question was a survey questionnaire distributed to ROICC and AROICC contract administration personnel. After review of all references and information from the literature search and after personal and telephone interviews with various NAVFAC contract personnel, a list of pertinent questions in each of the five sub-areas of the research question was

prepared. These questions were then compiled into a short answer mail response questionnaire.

a. Purpose

The main purpose of the questionnaire was to gather short, factual replies concerning the opinion and experience of junior officer contract administrators concerning training and the impact of that training on construction contract cost growth. These replies were intended to provide fact finding, descriptive and enumerative information. It is important to point out that the survey was not designed to show causal connections, but rather to indicate associations or correlations in a general sense.

b. Design

The most important consideration that influenced the design of the questionnaire was the question of bias. Because the questionnaire was planned to gather a combination of both short factual and opinion responses, the way in which the questions were posed was seen as a major consideration. To present questionnaire inquiries objectively, several different structural features were incorporated. Although questions were generally presented in area groupings for some cognitive continuity, some intermixing and dispersing of questions was used to reduce influence from physical closeness to previously answered questions. Four different response types were used: agree/disagree, rank order, multiple choice, and short response. The use of these forms of questions was varied throughout the survey. This use of different response types was intended to incorporate the "open" and "closed" concepts of questioning [Ref. 1: p. 40]. The open or free answer questions did give the respondents a choice, but were

followed by an opportunity for the respondent to clarify or comment on the response.

In summary, the questionnaire as shown in Appendix A was designed to impartially present a series of short, factual and attitudinal questions intermixed to some degree in both by content and response form to providing the respondents with a variety of levels of personal involvement.

c. Distribution

Distribution of the survey questionnaires was aimed at all NAVFAC junior officer construction contract administration personnel. For the purpose of this survey, junior-officers were defined as officers in the grade of Ensign, Lieutenant Junior Grade, and Lieutenant. This population was identified as the construction division engineers at the EFO/DICC's and the ROICC's or AFODICC's. Personnel in overseas construction contract-administration assignments were included with those in the continental United States. The NAVFAC P-1 provides a listing of all CEC personnel and their current assignments. A review of the NAVFAC P-1 dated April 1966 provided a listing of approximately 278 junior officers serving in construction contract-administration assignments. A personal letter with the questionnaire and a return envelope were sent to each of these officers. This approach was planned to yield responses from officers serving in construction contract administration assignments for the first time in their careers.

With this information, the size of the population and percentage of responses could be calculated. Therefore, if the level of response from the entire population were significant, the survey would yield results that could

be projected to the total population with a high level of confidence

3 The Personal Interview

Conducted concurrently with both the literature search and the survey questionnaire was a series of interviews with persons knowledgeable in various aspects of management training associated with contract-construction administration. The people interviewed were in various levels of the contract administration organizations of NAVFAC, including the Civil Engineer Corps Officer School and the Naval Facilities Contracts Training Center. The interviews were conducted in a free-form manner. The primary purpose of pre-questionnaire interviews was that of problem and question seeking, while the purpose of post-questionnaire interviews was that of results discussion. At no time were official NAVFAC policy statements sought.

C ANALYSIS METHODOLOGY

Since the questionnaire was designed as a simple fact-finding, descriptive and enumerative survey the corresponding analysis methodology has been kept equally simple. Data derived from questions requiring nominal or ordinal type answers are usually tabulated for frequency of various replies. These results are then usually expressed as percentages of the total number of replies. Interval and ratio data are treated either in a simple enumerative manner as above or under the procedures that assume the normal distribution in parametric statistics. The normal distribution is a continuous distribution fully determined by two parameters, its mean (\bar{x}) and standard deviation (s). Represented by the familiar bell-shaped curve,

the normal distribution model was chosen for use in analyzing some survey results because the outcomes of various questions appear to be influenced by a large number of independent small factors for which this distribution is a close fit. The characteristics of a normal distribution hold that when a random variable is normally distributed, more than 68 percent is within one standard deviation, more than 95 percent is within two standard deviations and nearly everything is within three standard deviations. Within the questionnaire, results such as the dollar value of contracts on which the officer has authority and the time spent on change-order administration were subject to this type of analysis.

III. PRESENTATION OF DATA COLLECTED

Chapter III is a quantitative presentation and discussion of the survey responses on a question by question basis. For cognitive continuity, the responses to the survey questions have been grouped into seven areas.

- A. SURVEY RETURN RATE
- B. BACKGROUND DATA
 - 1. Level of Formal Training
 - 2. Dollar Value of Contracts as Reported by Group
 - 3. Contract Cost Growth Statistics
 - 4. Change-Orders as a Time Consuming Activity
 - 5. Time Devoted to The Constructability Review Process
- C. CHANGE-ORDER COMPONENT ANALYSIS
- D. COST ESTIMATION
- E. ATTITUDES AS TO THE IMPACT OF TRAINING ON CONTRACT COST-GROWTH
- F. TRAINING COURSE RECOMMENDATIONS
- G. SUMMARY

In total, the contents of this chapter represent a summary of the attitudes and beliefs of NAVFAC junior-officer contract administrators as to the current state of training and cost growth in Navy contract construction. An in-depth analysis of the survey responses, in support of the thesis objectives, will be the subject of Chapter IV.

A SURVEY RETURN RATE

The rate of response from the NAVFAC construction contract administration community to the questionnaire was quite high. Figure 3.1 is a graphic representation of the responses generated from the 275 questionnaires distributed to RBICC and ARBICC junior officer personnel.

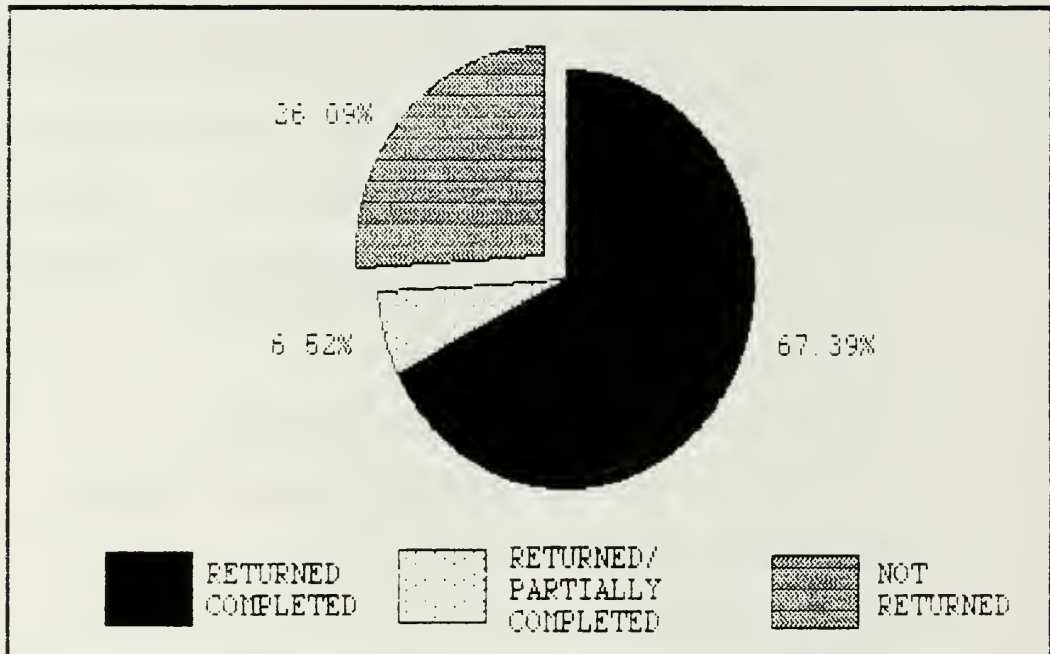


Figure 3.1 Survey Response

The 18 questionnaires (6.52%) that were returned only partially completed by the respondents contained general comments, with no specific answers to the questions submitted. The reasons cited by the personnel returning but not completing the questionnaire was that they were no longer serving in a construction contract administration assignment and did not have the specific information requested. The general comments provided were, however, utilized in the overall analysis that is presented in Chapter IV and as inputs to the conclusions and recommendations presented in

Chapter V Otherwise, the useful response rate to the questionnaire was 73.91%.

3. CURRENT CONTRACT ADMINISTRATION DATA

1. Level of Formal Training

The total survey population was broken into three demographic groups identified by officer rank:

- Ensign (ENS)
- Lieutenant Junior Grade (LTJG)
- Lieutenant (LT)

To determine the formal training background characteristics of the population as a whole in addition to the demographic groups in particular, Question 1 of the survey provided each respondent with a list of subject areas in which various formal training courses are available. The question was worded as follows:

The following is a list of subject areas where formal training is available either at Port Hueneme or by a variety of civilian institutions. Please mark those subject areas in which you have received formal training **PRIOR TO** or **DURING** your current assignment. (This question refers to formal training you have received after your college education and after the basic school at Port Hueneme.)

<u>Prior to</u>	<u>During</u>	
—	—	Contract-Construction
—	—	Admin & Management
—	—	Construction Contract
—	—	Modifications
—	—	Negotiation Workshops
—	—	Contract Law
—	—	Construction Cost Estimation
—	—	Various Construction

<input type="checkbox"/>	<input type="checkbox"/>	Inspection Courses
<input type="checkbox"/>	<input type="checkbox"/>	Business Letter Writing
<input type="checkbox"/>	<input type="checkbox"/>	Delay and Disruption
<input type="checkbox"/>	<input type="checkbox"/>	Facility Support Contracts
<input type="checkbox"/>	<input type="checkbox"/>	Cost & Price Analysis
<input type="checkbox"/>	<input type="checkbox"/>	Other_____

For the purpose of determining the overall level of formal training held by the respondents, the response to this question was first tabulated in total for each particular course subject, without distinction as to the demographic groups. The various courses that were listed under "other" were added to the gross total of courses taken by each respondent, but not identified separately. The graphic representation for the total population, by subject areas, is presented in Figure 3.2a and Figure 3.2b.

For the purpose of interpreting the influence that formal training in general has on construction contract cost growth, the answers to Question 1 were further aggregated into the gross number of training courses taken by the respondent, with no particular emphasis given to the course type. This information is broken out into demographic groups and is presented in Figure 3.3.

Table 3.1 is an additional representation of the total number of formal training courses completed by the respondents with statistical data such as the mean and standard deviation provided.

As a measure of the emphasis placed on training junior officers during their assignments as officers in charge of construction, the respondents were asked the following question:

Does your office have a training program for contract administrators?
☐ Yes ☐ No ☐ Not Sure

The results of this question were tabulated for the entire population and are presented in Figure 3.4. It is interesting to note that there is approximately a 50-50 split in the response.

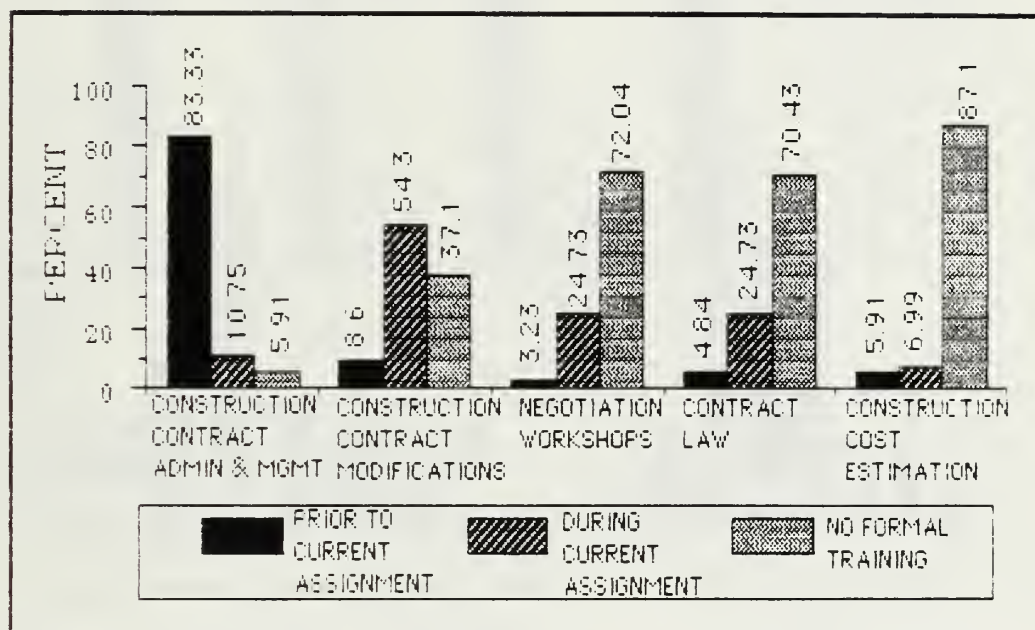


Figure 3.2a Formal Training in Specific Areas as a Percent of Total Population

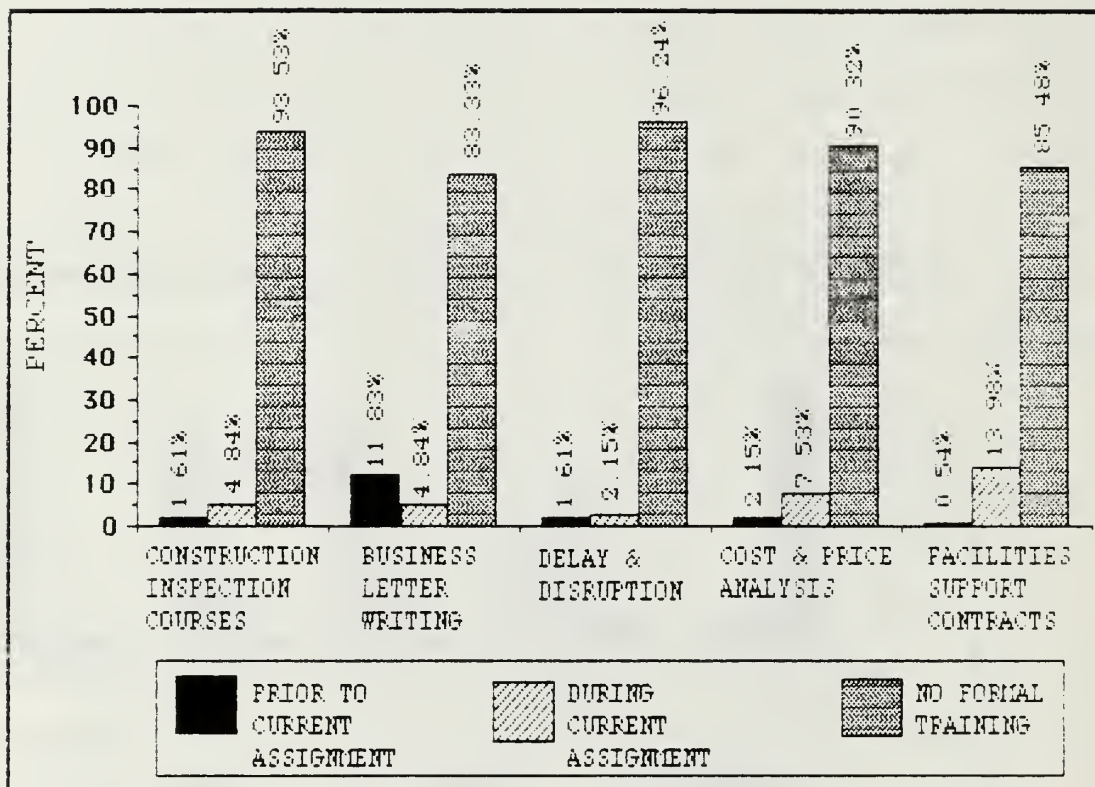


Figure 3.2b Formal Training in Specific Areas as a Percent of Total Population

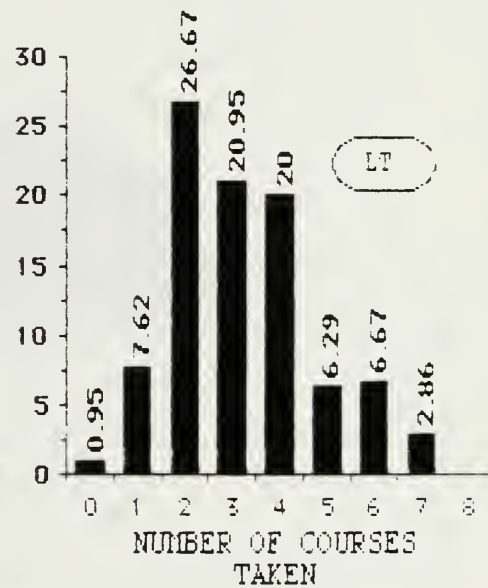
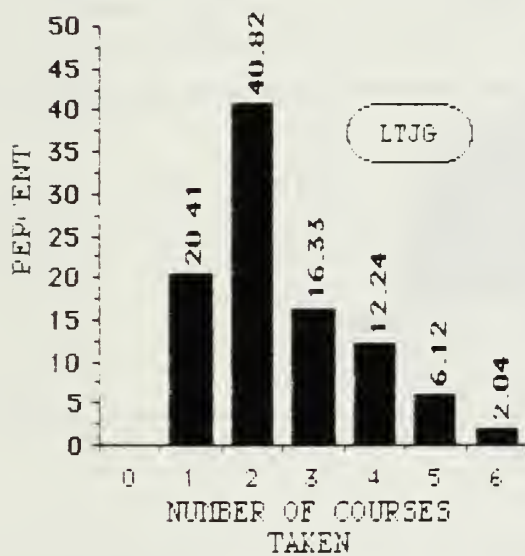
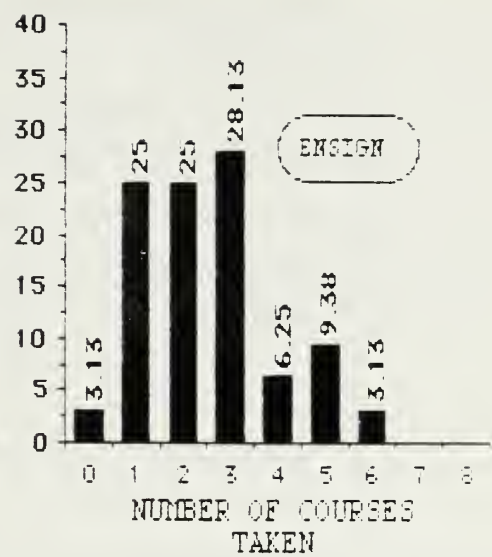
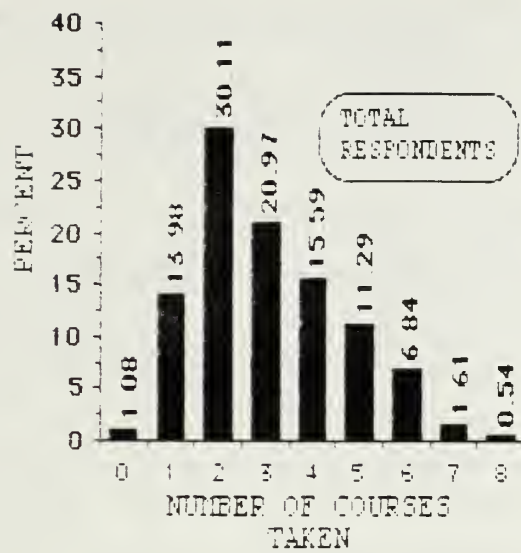


Figure 3.3 Formal Training Course Totals by Group

TABLE 3.1
TOTAL FORMAL TRAINING COURSE SUMMARY

	n	\bar{X}	Min	Max	S
ENSIGN	30	1.5	0	6	1.437
LTJG	49	2.592	1	8	1.471
LT	105	3.352	0	7	1.544
TOTAL	186	3.005	0	8	1.551

As a measure of the emphasis placed on training junior officers during their assignments as officers in charge of construction, the respondents were asked the following question:

Does your office have a training program for contract administrators?
☐ Yes ☐ No ☐ Not Sure

The results of this question were tabulated for the entire population and are presented in Figure 3.4. It is interesting to note that there is approximately a 50-50 split in the response.

2 Dollar Value of Contracts as Reported by Group

The total dollar value of the contracts being administered by each respondent was requested as a means of determining the relative level of responsibility for the expenditure of public funds that is held by the

respondent. As will be discussed in Chapter IV, a change of only one or two percentage points in the change-order rate of an individual can result in significant monetary savings that may exceed the direct costs of any training program. This data is tabulated by demographic group in Table 3.2. It is interesting to note the dollar value of contract responsibility that is held by even the most junior officer.

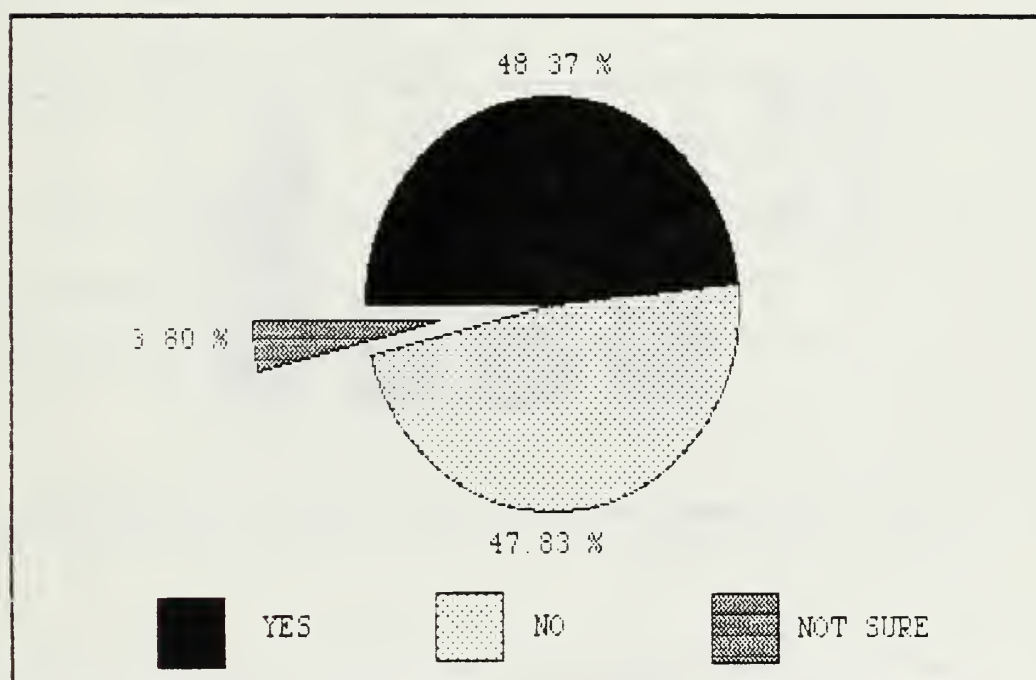


Figure 3.4 Percent of Junior Officers Reporting a Training Program

TABLE 3.2
TOTAL DOLLAR VALUE OF CONTRACTS (MILLIONS)

	n	\bar{X}	Min	Max	S
ENSIGN	32	9.21	0.7	34	7.57
LTJG	49	10.04	1	40	7.96
LT	105	16.69	1.2	83	14.11
TOTAL	186	13.65	0.7	63	12.38

3. Contract Cost Growth Data

The cost growth of any particular construction contract is measured by the dollar value of change-orders as a percent of the original contract bid price. The respondents were asked the following two questions relating to contract cost growth data:

What is the change-order rate your office currently experiences on construction contracts?

_____ %

___ Not Sure

What is your own change-order rate on contracts you are administering?

_____ %

___ Not Sure

The measure of change-order rates is an important control mechanism in the effective administration of construction contracts. The Naval Facilities Engineering Command tracks such data and establishes goals

based on rates that are representative of historical norms for particular types of contracts, most notably new construction and renovation. The percentages established as goals are not important to this study. What is interesting, though, is the percentage of respondents that are not aware of the change-order rates for their individual contracts or their office as a whole. This data is presented in Figure 3.5.

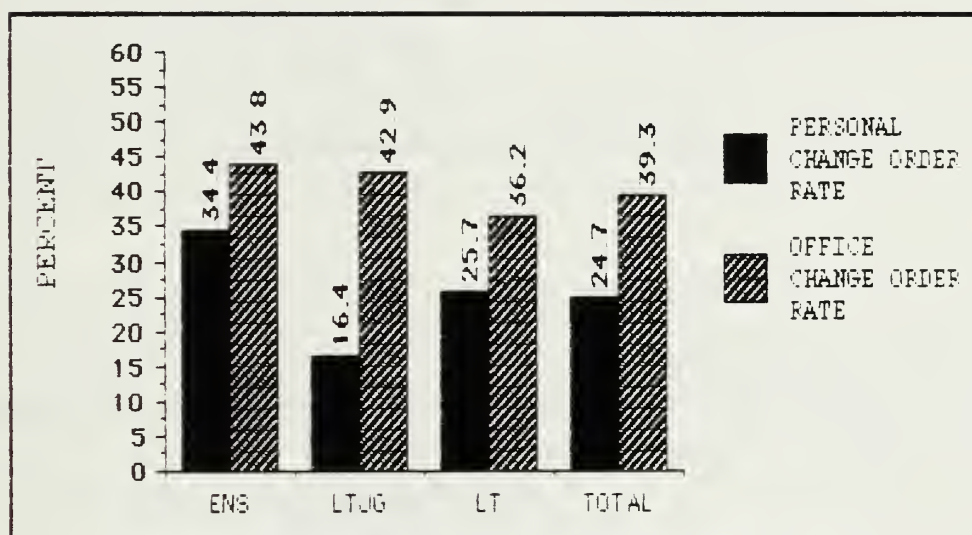


Figure 3.5 Percent by Group Unaware of Change-Order Rates

For those who were aware of the change-order rate for their personal contracts and the office as a whole, the data was tabulated by demographic groups and is presented in Table 3.3 and Table 3.4.

TABLE 3.3

PERSONAL CHANGE ORDER RATES
(PERCENT)

	n	\bar{X}	Min	Max	S
ENSIGN	31	6.00	3	15	3.619
LTJG	41	5.122	0.8	20	3.353
LT	78	5.202	1	30	4.886
TOTAL	140	5.300	0.8	30	4.271

TABLE 3.4

OFFICE CHANGE ORDER RATES
(PERCENT)

	n	\bar{X}	Min	Max	S
ENSIGN	18	7.21	3	15	4.341
LTJG	28	5.243	0.5	15	3.952
LT	67	6.688	1	23	4.809
TOTAL	113	6.412	0.5	23	4.554

4 Change-Order Administration as a Time Consuming Activity

As stated in the problem-description section of Chapter I, a change-order on a contract construction project involves a great amount of time and effort on the part of the contract administrator to fully identify, inspect, estimate, negotiate, and document the changed condition. Every additional minute devoted to change-order administration is a minute removed from the administrator's efforts to avoid cost growth through constructability reviews of pending construction projects and increased attention to quality construction through inspections directed at contractor compliance with existing contract plans and specifications.

The respondents were asked the following question as a means of quantifying this important measure of contract administration activity:

An average change-order begins with the identification of the changed condition and ends with a modification to the construction contract. Between these two points, the time you devote to administering the change-order is divided in varying degrees among funding requests, cost estimation, site visits, various pieces correspondence, negotiations, and the final write-up.

Of all the time you devote to contract administration, what is your estimate of the percentage of your time devoted to change-orders?

<input type="checkbox"/> 10%	<input type="checkbox"/> 40%	<input type="checkbox"/> 70%	<input type="checkbox"/> 100%
<input type="checkbox"/> 20%	<input type="checkbox"/> 50%	<input type="checkbox"/> 80%	
<input type="checkbox"/> 30%	<input type="checkbox"/> 60%	<input type="checkbox"/> 90%	

This data was broken out by demographic groups as is presented in Figures 3.6 through 3.9.

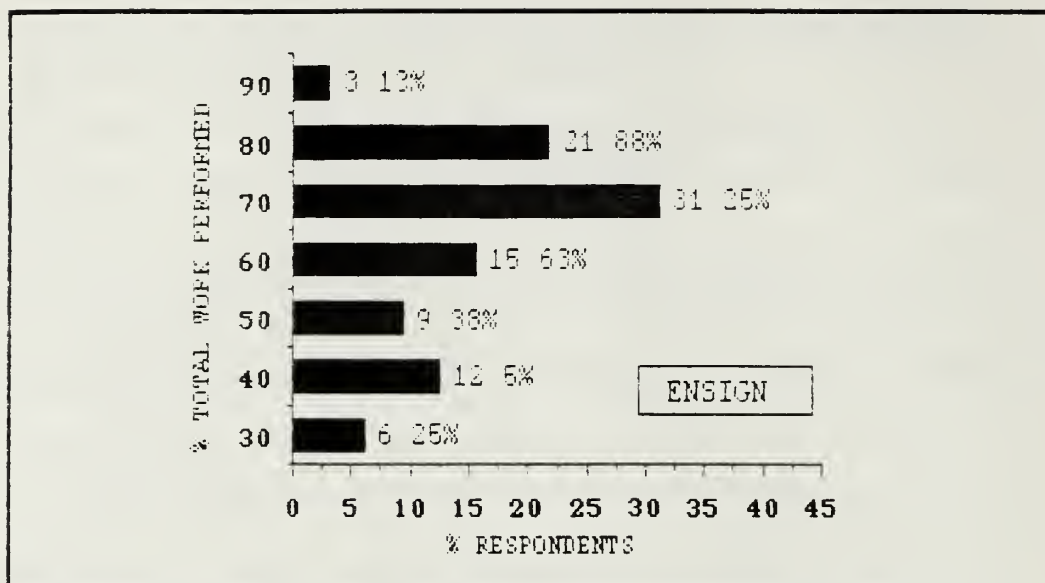


Figure 3.6 Change-Order Administration as a Percent of Total Work Performed

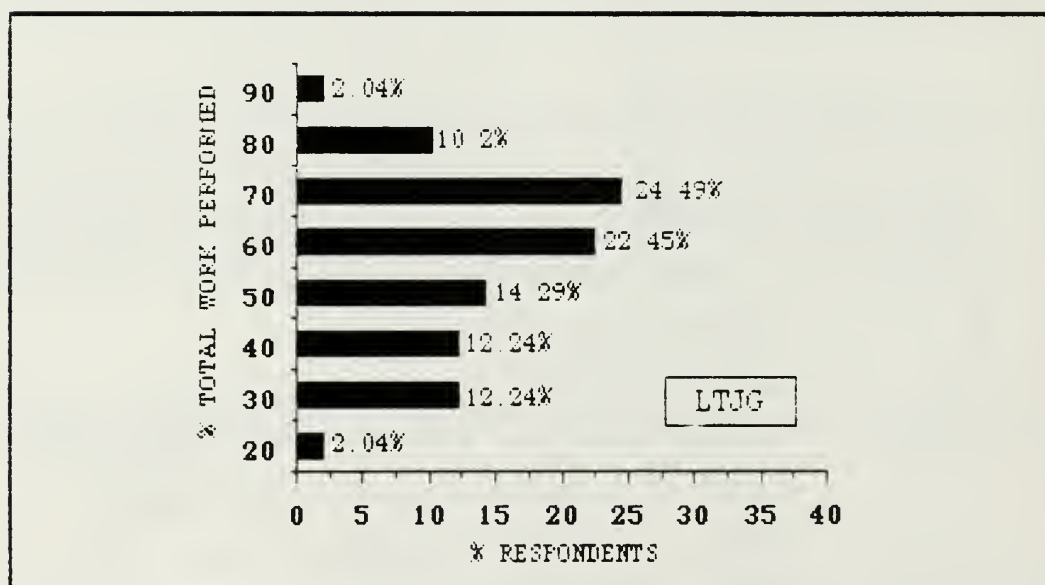


Figure 3.7 Change-Order Administration as a Percent of Total Work Performed

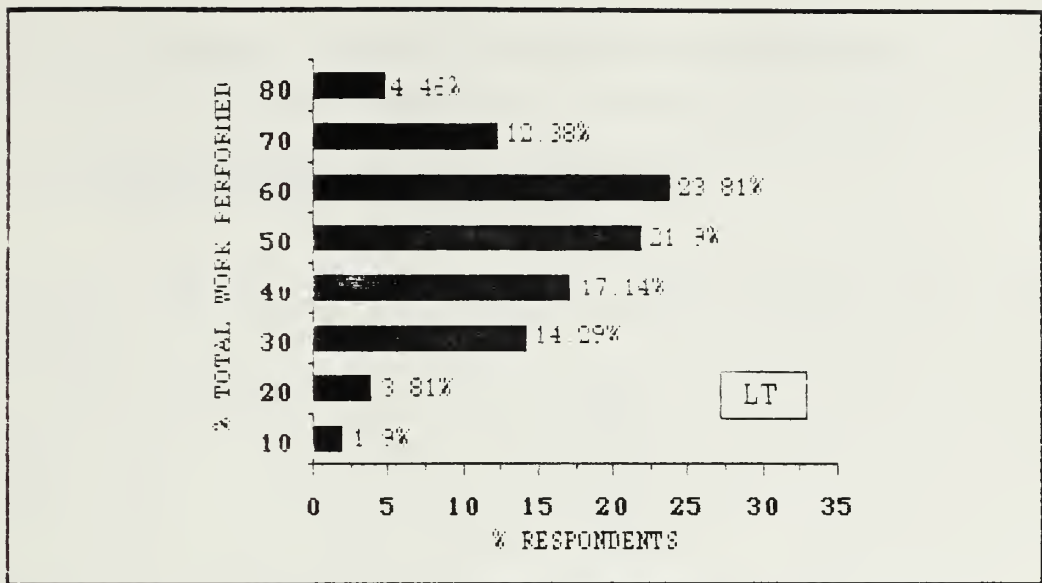


Figure 3.8 Change-Order Administration as a Percent of Total Work Performed

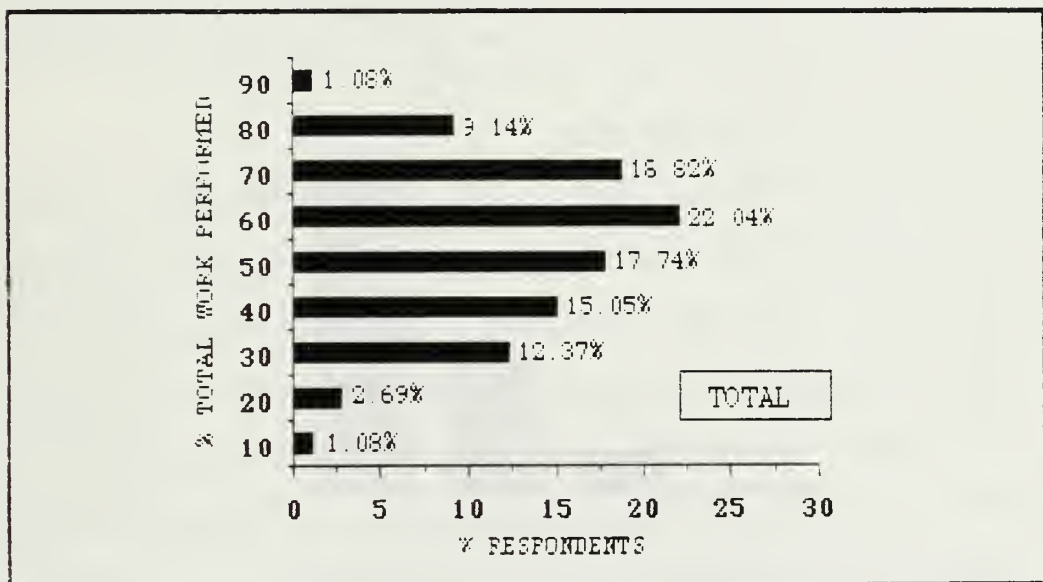


Figure 3.9 Change-Order Administration as a Percent of Total Work Performed

Table 3.5 is an additional representation of the total time devoted to change-order administration by the respondents with statistical data such as the mean and standard deviation provided.

TABLE 3.5

CHANGE ORDER ADMINISTRATION AS A PERCENT OF
TOTAL WORK PERFORMED BY GROUP

	n	\bar{X}	Min	Max	S
ENSIGN	32	63.13	30	90	16.15
LTJG	49	56.73	20	90	16.88
LT	105	49.86	10	80	16
TOTAL	186	53.95	10	90	16.96

5. Constructability Reviews

Before a contract construction project is advertised for competitive bidding, the office that will eventually be responsible for administering the contract is given an opportunity to review the plans and specifications from a construction point-of-view. The rationale for this review process is that the perfect set of plans and specifications has never been written, and changes made before competitive bidding are always less costly than changes resulting from negotiation after the contract has been awarded. Change-order administration on existing contracts is also a time consuming process that diverts the attention of the officer in charge of construction from other critical items of administration such as monitoring the contractor's success in complying with the contract documents in areas of construction and the creation of sufficient and accurate documentation in

matters of contract disputes. The respondents to the questionnaire were asked the following question as a means of quantifying the time devoted to constructability reviews:

Of all the time you devote to contract administration, what is your estimate of the percentage of your time devoted to constructability reviews?

- | | |
|---------------------------------------|------------------------------|
| <input type="checkbox"/> less than 5% | <input type="checkbox"/> 50% |
| <input type="checkbox"/> 10% | <input type="checkbox"/> 60% |
| <input type="checkbox"/> 20% | <input type="checkbox"/> 70% |
| <input type="checkbox"/> 30% | <input type="checkbox"/> 80% |
| <input type="checkbox"/> 40% | <input type="checkbox"/> 90% |

The data for the total population is presented in Figure 3.10.

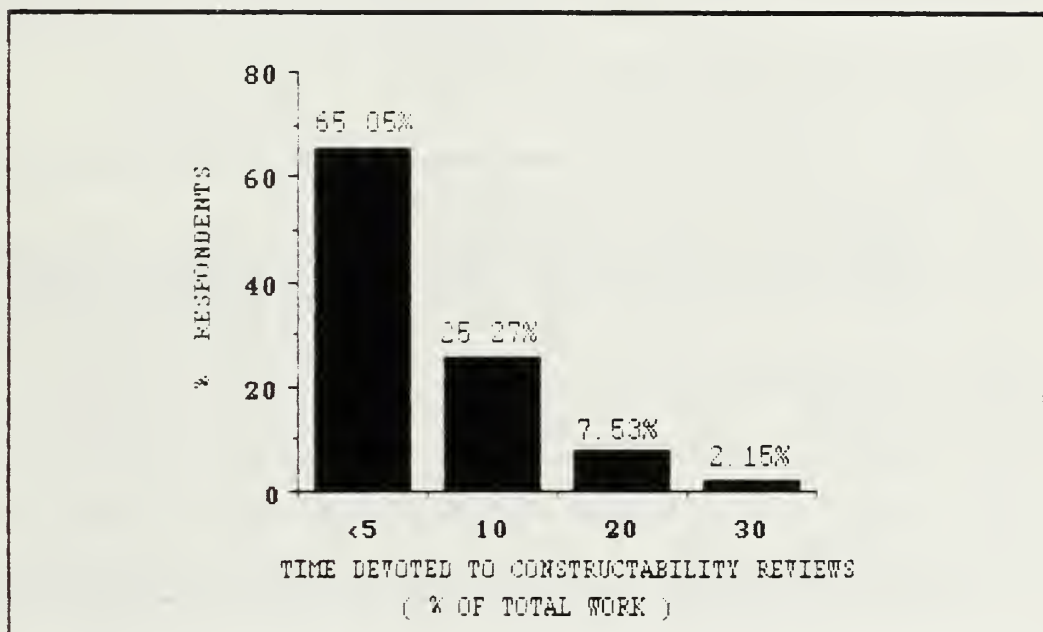


Figure 3.10 Percent of Total Administration Time Devoted to Constructability Reviews

As a means of quantifying the impact that good constructability reviews have on contract cost growth, the following question was asked of each respondent.

For the purposes of this question, assume that the average change-order rate for all construction contracts you administrate is 10%.

What is your estimate of the portion of that 10% that can be attributed to errors in the plans and specifications that could have been identified prior to bidding by a thorough constructability review?

_____5

The response to this question was rather interesting. The respondents indicated that almost 60% of all change-orders result from errors in the plans and specifications that could have been identified in a good constructability review prior to the bidding process. In light of this data, it is also interesting to recall that average contract administrators spends less than 5% of their time on constructability reviews. The statistical data obtained from this question is presented in Table 3.6

TABLE 3.6					
PERCENT OF CHANGE ORDERS RESULTING IN CONTRACT COST GROWTH BECAUSE OF ERRORS IN THE PLANS AND SPECIFICATIONS THAT COULD HAVE BEEN DISCOVERED IN A THOROUGH CONSTRUCTABILITY REVIEW					
	n	X	Min	Max	S
ENSIGN	32	61.72	10	95	23.01
LTJG	49	60.92	10	95	23.69
LT	104	57.60	0	99	23.92
TOTAL	185	59.19	0	99	23.66

C. CHANGE-ORDER COMPONENT ANALYSIS

The average change-order can be broken out into six different areas, each requiring different technical and administrative skills. These six areas, in

no particular order, are as follows:

1. Negotiation
2. Correspondence
3. Final Write-up
4. Cost Estimation
5. Construction Site Visits
6. Funding Requests

Each component consumes different amounts of the total time devoted to change-order administration. As a means of determining the relative ranking of each component as a consumer of administrative time, the respondents to the survey were asked the following question:

From your experience, please rank the following components of an average change-order in increasing order from the most time required to the least time required (1= most time required)

- | | |
|---|---|
| <input type="checkbox"/> Negotiation | <input type="checkbox"/> Cost Estimation |
| <input type="checkbox"/> Correspondence | <input type="checkbox"/> Construction Site Visits |
| <input type="checkbox"/> Final Write-up | <input type="checkbox"/> Funding Requests |

The results generated from the total population were averaged for each component and are displayed in Figure 3.11.

The time devoted to each component is also a function of the experience and training of the individual contract administrator. Accordingly, the data obtained from this question is further broken

out by component with the relative ranking compared between the

demographic groups. This data is displayed in Tables 3.7 through 3.12. The modal value is in **bold** print.

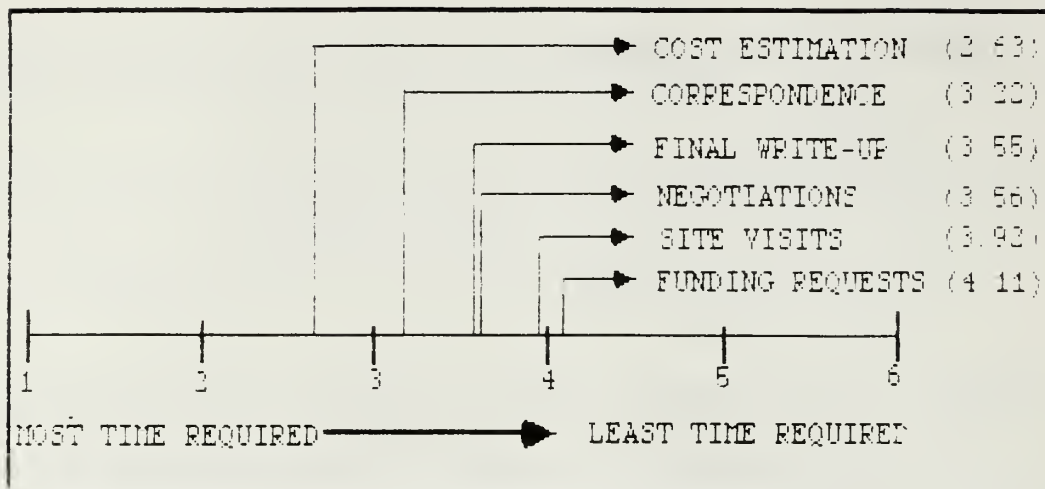


Figure 3.11 Change-Order Components. Average Ranking by Time Required

TABLE 3.7

REPORTED RANKING OF NEGOTIATIONS AS A CONSUMER OF
ADMINISTRATIVE TIME DEVOTED TO CHANGE ORDERS

		% ENSIGN	% LTJG	% LT	% TOTAL
Most Time ↓	1	9.38	8.16	9.62	9.19
	2	15.63	16.32	13.46	14.59
	3	28.12	16.32	24.04	22.70
	4	15.63	24.49	30.77	26.49
Least Time	5	18.75	22.45	15.39	17.84
	6	12.50	12.26	6.73	9.19

TABLE 3.8

REPORTED RANKING OF CORRESPONDENCE AS A CONSUMER OF
ADMINISTRATIVE TIME DEVOTED TO CHANGE ORDERS

RANK		% ENSIGN	% LTJG	% LT	% TOTAL
Most Time ↓ Least Time	1	9.375	22.449	20.132	19.919
	2	18.75	18.367	23.077	21.081
	3	15.625	18.367	17.308	17.297
	4	31.25	14.286	9.615	14.595
	5	6.25	20.408	19.231	17.297
	6	18.75	6.122	10.577	10.811

TABLE 3.9

REPORTED RANKING OF THE FINAL WRITE-UP AS A
CONSUMER OF ADMINISTRATIVE TIME DEVOTED TO CHANGE ORDERS

RANK		ENSIGN	LTJG	LT	TOTAL
Most Time ↓ Least Time	1	18.75	16.327	13.462	15.135
	2	12.5	18.367	22.115	19.459
	3	9.375	14.286	17.308	15.135
	4	15.625	16.327	11.538	13.514
	5	21.875	18.367	18.269	18.919
	6	21.875	16.327	17.308	17.838

TABLE 3 10

REPORTED RANKING OF COST ESTIMATION AS A CONSUMER
OF ADMINISTRATIVE TIME DEVOTED TO CHANGE ORDERS

RANK		% ENSIGN	% LTJG	% LT	% TOTAL
Most Time ↓ Least Time	1	18.75	30.612	25	25.405
	2	34.375	28.571	17.308	23.243
	3	28.125	28.571	25.962	27.027
	4	15.625	4.082	17.308	13.514
	5	3.125	3.163	10.577	3.649
	6	0	0	3.846	2.162

TABLE 3 11

REPORTED RANKING OF SITE VISITS AS A CONSUMER OF
ADMINISTRATIVE TIME DEVOTED TO CHANGE ORDERS

RANK		% ENSIGN	% LTJG	% LT	% TOTAL
Most Time ↓ Least Time	1	25	6.122	10.577	11.892
	2	6.25	14.286	11.538	11.351
	3	6.25	14.286	11.538	11.351
	4	12.5	26.531	22.115	21.622
	5	37.5	20.408	24.038	25.405
	6	12.5	18.367	20.192	18.376

TABLE 3.12

REPORTED RANKING OF FUNDING REQUESTS AS A CONSUMER
OF ADMINISTRATIVE TIME DEVOTED TO CHANGE ORDERS

RANK		% ENSIGN	% LTJG	% LT	% TOTAL
Most Time	1	15.625	14.286	22.115	18.919
	2	15.625	6.122	12.5	11.351
	3	12.5	8.163	2.885	5.946
	4	9.375	14.286	7.692	9.73
	5	12.5	10.204	12.5	11.892
Least Time	6	34.375	46.939	42.308	42.162

D. COST ESTIMATION

As displayed in Figure 3.10, cost estimation is the activity reported by the respondents that requires the most time in the change-order process. This agrees with the author's own experience and reinforces the perception that cost estimation is a complex activity, based on broad experience in the construction industry. Accurate cost estimation is also the bread and butter of any successful construction firm. Accordingly, the individual contract administrator is often placed in a weak negotiating position if substantial time has not been devoted towards generating the most accurate estimate possible.

The purpose of the following question was to determine what areas of cost estimation are reported as the most difficult for individual contract administrators:

Which areas of a change-order do you find the most difficult to estimate?
 (please rank in order from most to least difficult...
 (1= most difficult)

- | | |
|--|---|
| <input type="checkbox"/> Labor costs | <input type="checkbox"/> Material costs |
| <input type="checkbox"/> Equipment costs | <input type="checkbox"/> Field & Home Office Overhead |
| <input type="checkbox"/> Scope of work | |

The answers to this question were tabulated for the entire population and are presented in Figure 3.12.

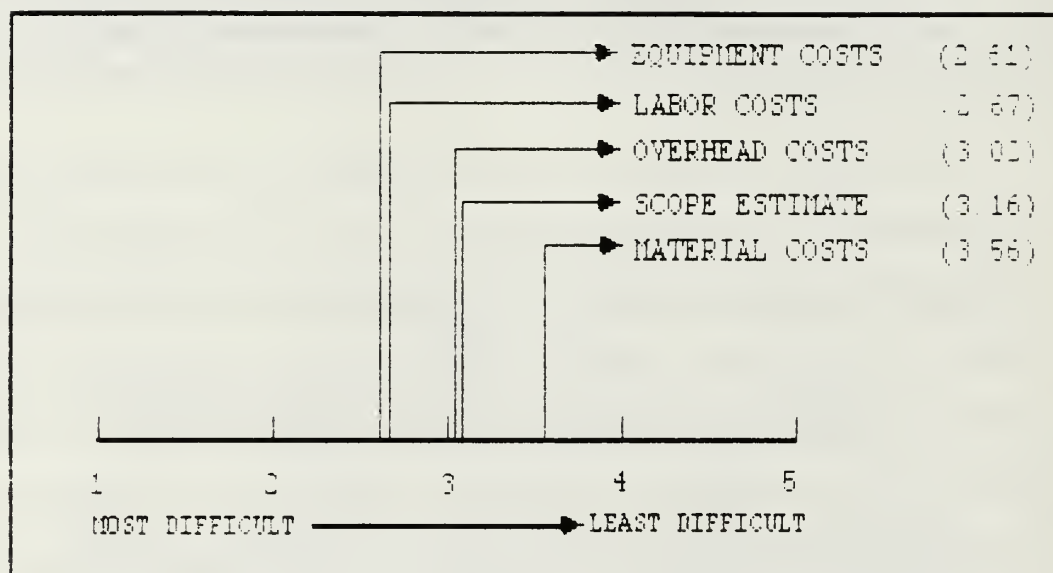


Figure 3.12 Estimating Difficulty by Cost Groups

In recognition of the difficulty involved in obtaining an accurate government estimate of a changed condition, estimating divisions have been established at some construction-contract offices as an aid to the individual contract administrator. In this regard, the respondents were asked the following question concerning estimating divisions:

Does your office have a separate division dedicated solely to providing change-order estimates at your request?

☐ Yes

☐ No

The response to this question is displayed in Figure 3.13

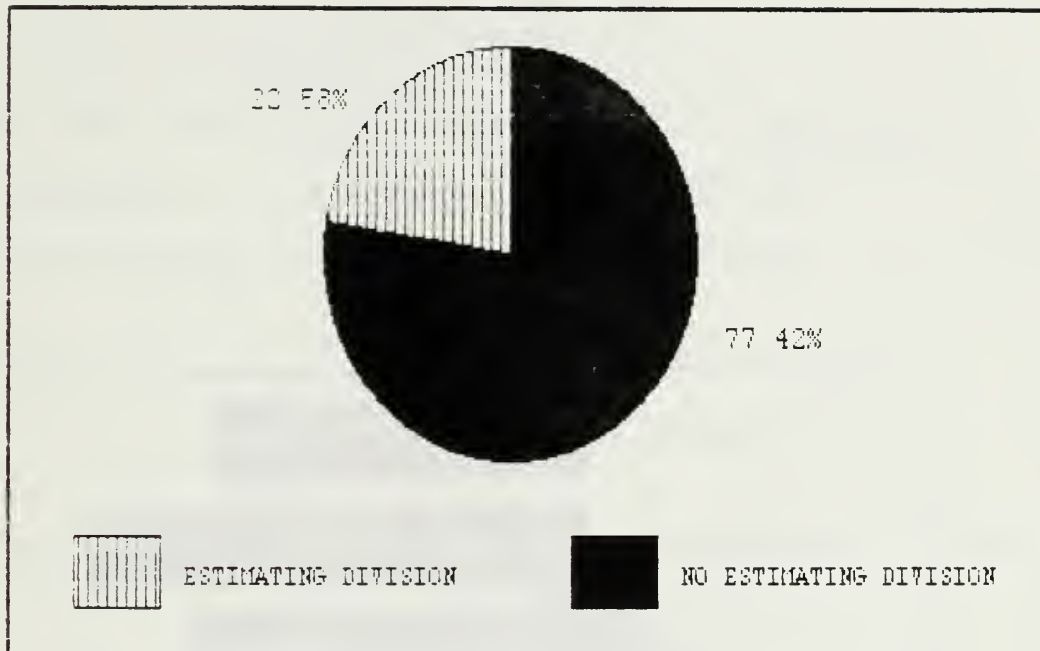


Figure 3.13 Reported Availability of an Estimating Division

For those respondents who have the assistance of an estimating division the following additional questions were asked:

1. How often do you feel that the estimates generated by this division are more accurate than your own?

☐ All the time

☐ Most of the time

☐ Occasionally

☐ Seldom

The results to this question are displayed in Figure 3.14

2. If you were the boss and had to choose between hiring an additional contract administrator or hiring additional construction estimators, what would be your decision?

- ☐ Hire the additional contract administrator
- ☐ Hire the additional estimators

The results to this question are displayed in Figure 3.15.

3. Do you feel that your estimating division is understaffed, overstaffed, or appropriate?

- ☐ Understaffed
- ☐ Overstaffed
- ☐ Appropriate

The results generated by the respondents to this question are displayed in Figure 3.16.

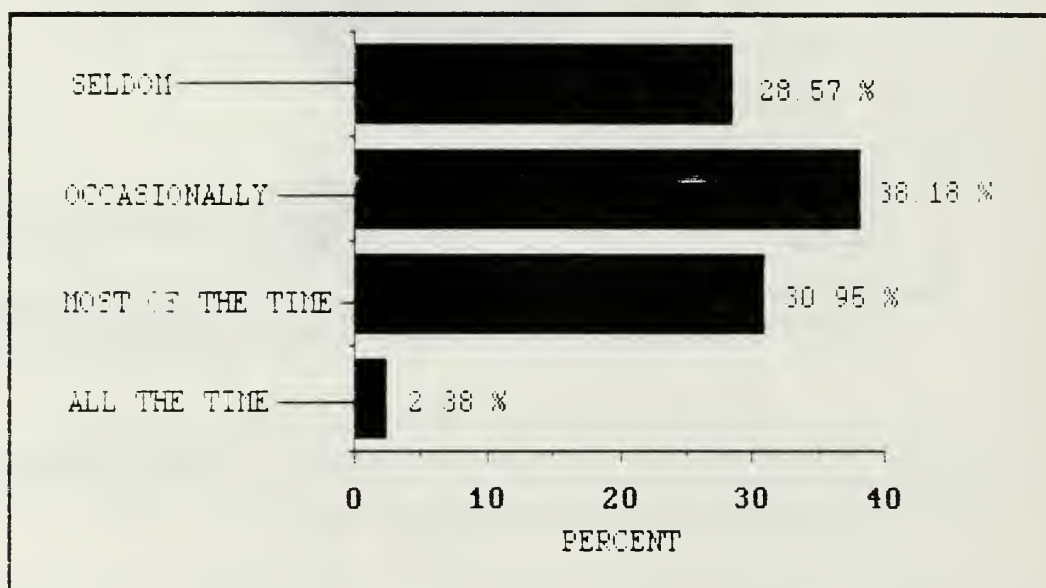


Figure 3.14 Reported Accuracy of Estimating Division Estimates

When a change-order resulting from a design error has occurred, the individual contract administrator has the option of requesting an estimate from the Architect/Engineer (A&E) who designed the project. To determine how often this aid to obtaining an accurate estimate is used, the following question was asked:

When a design coded change-order has occurred, do you request that the Architect/Engineer (A&E) provide you with an estimate of the changed condition?

☐ All the time

☐ Most of the time

☐ Seldom

☐ Never

The response to this question is displayed in Figure 3.17

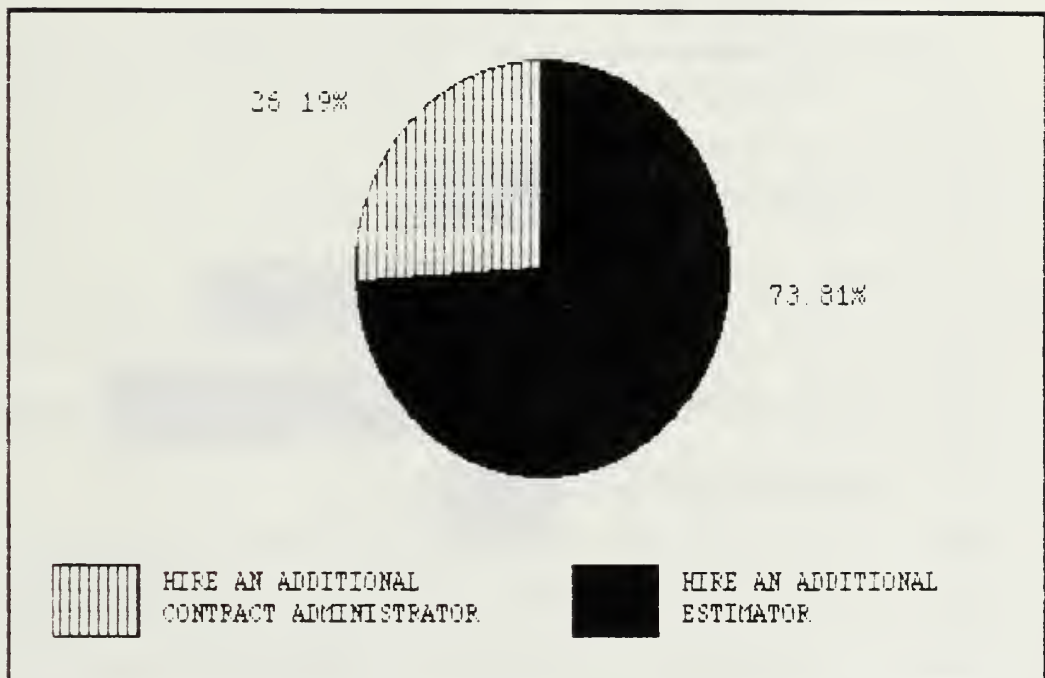


Figure 3.15 If You Were The Boss, Who Would You Hire?

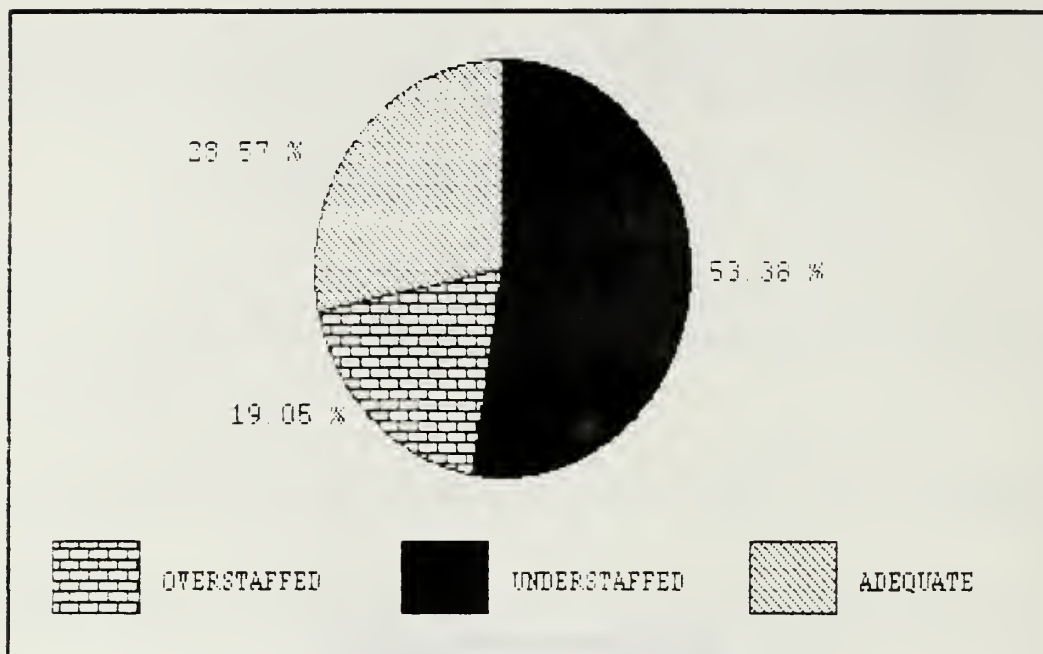


Figure 3.16 Staffing Level of The Estimating Division

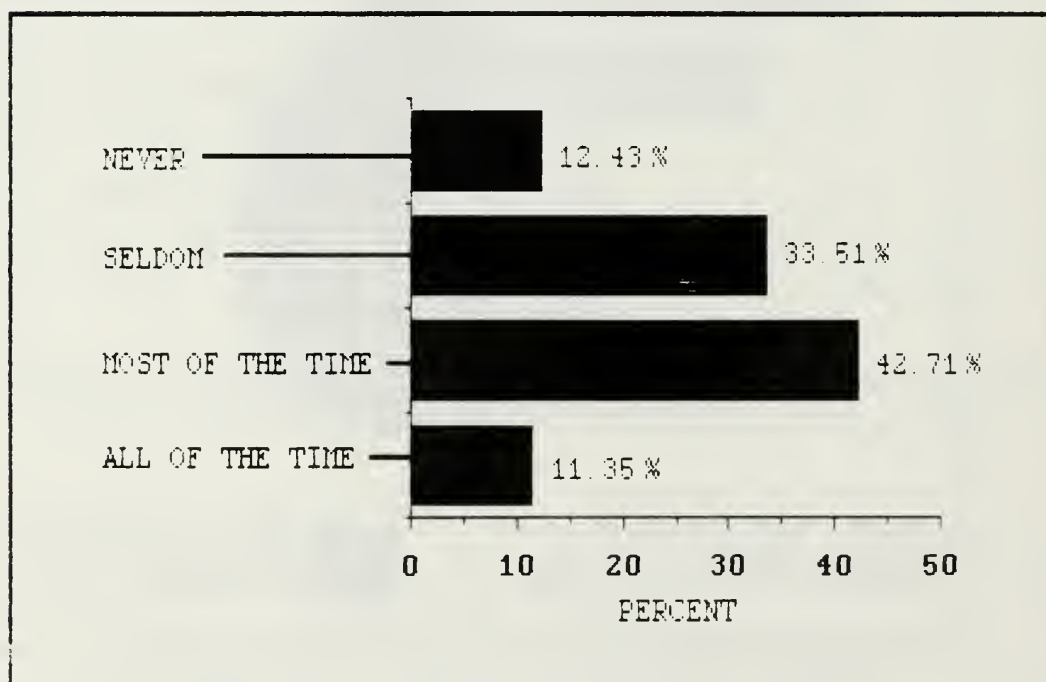


Figure 3.17 Percent Requesting Estimate From Architect/Engineer

Again, the author's experience has shown that the estimates generated by the Architect/Engineer are not always the most useful. As a means of exploring this observation further, the following question was asked of the respondents.

From your experience, what is the greatest problem with requesting an estimate from an A/E?

The items mentioned most frequently by the respondents were as follows.

Lack of timeliness-----96% of the respondents

Estimate is far too low-----75% of the respondents

Too little detail in the estimate----45% of the respondents

Regardless of the source, all government estimates are required to be prepared in a manner that is independent of the information provided on the contractor's submitted estimate of costs. Estimates produced by an Architect/Engineer or by members of a supporting estimating division generally meet this requirement because of the third party relationship to the contracting parties. When the junior officer in charge of construction must produce an estimate without outside assistance, there is frequently a temptation to use the contractor's estimate as a guide, aid, or reference in the preparation of the Government estimate. As a means of determining the ability of the respondents to produce a truly independent Government estimate, the following question was asked:

An independent estimate is defined as an estimate that is determined using the identified scope of the changed condition and various aids to estimation.

How often do you use the contractor's estimate as an aid or guide in conducting your own estimate? (Be honest!)

- | | |
|---|---|
| <input type="checkbox"/> All the time | <input type="checkbox"/> Most of the time |
| <input type="checkbox"/> Some of the time | <input type="checkbox"/> Never |

The response to this question is shown in Figure 3.18.

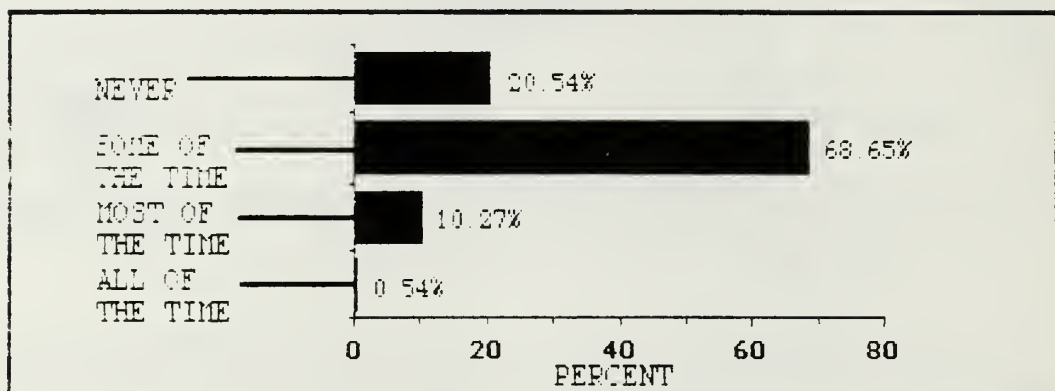


Figure 3.18 Percent of Respondents Using The Contractor's Estimate as an Aid to Producing the Government Estimate

E. IMPACT OF TRAINING ON CONTRACT COST GROWTH

As a means of determining the impact of on-the-job training on contract-construction cost growth, the following question was asked of each respondent to the survey questionnaire:

One of the basic assumptions of "on-the-job training" is that we learn by our mistakes. Looking back on your experience as a change-order estimator and negotiator, do you now feel that some of your contractors were over compensated on legitimate change-orders?

- | | |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

The results of this question are displayed in Figure 3.19.

As a means of determining the impact that formal training has on reducing errors in change-order administration, the respondents who answered yes to the previous question were asked the following amplifying question:

From your experience, how many of these instances of over-compensation could have been avoided with sufficient training prior to your current assignment?

☐ All ☐ Most ☐ Some ☐ None

The results of this question are displayed in Figure 3.20.

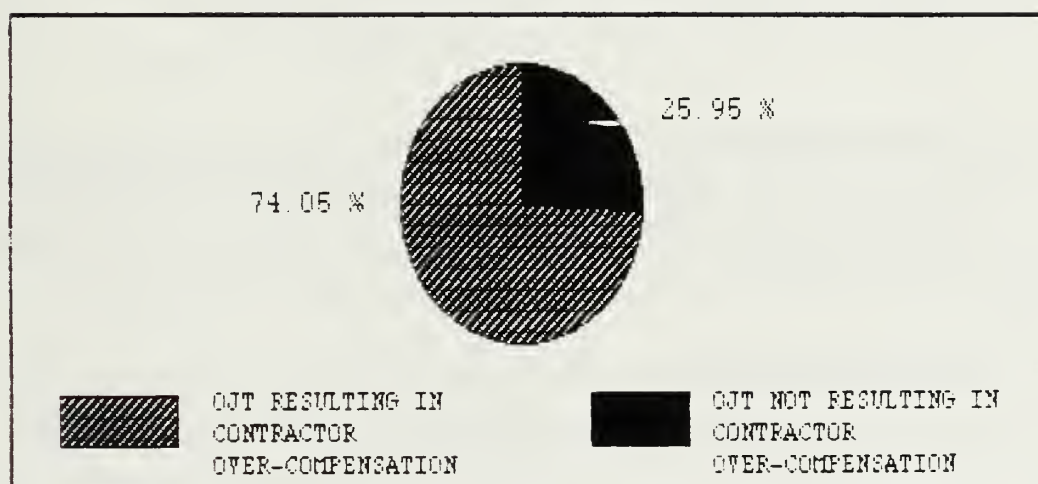


Figure 3.19 OJT as a Factor in Additional Contractor Compensation

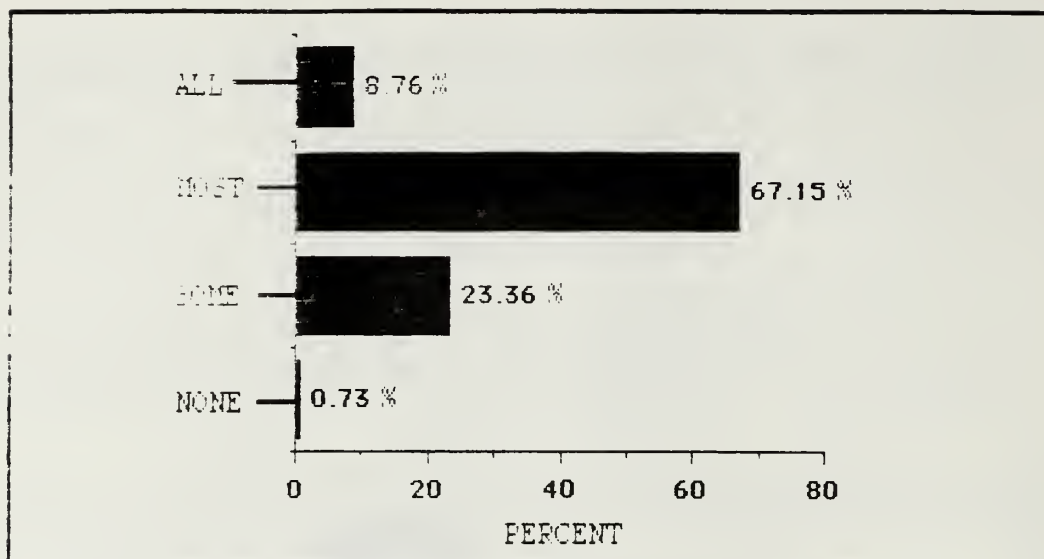


Figure 3.20 Training as a Factor Resulting in Additional Contractor Compensation

As a measure of the relative experience of the junior officer contract administrators in relation to the contractors with whom they conduct change-order negotiations, the respondents were asked to use 20/20 hindsight and answer the following question:

Again, looking back at your experience as a contract administrator, do you feel that some of your contractors have "talked" their way into receiving compensation for changed conditions that were not the responsibility of the government?

☐ Yes

☐ No

If yes, please elaborate:

The graphical representation of the response to this question is shown in Figure 3.21

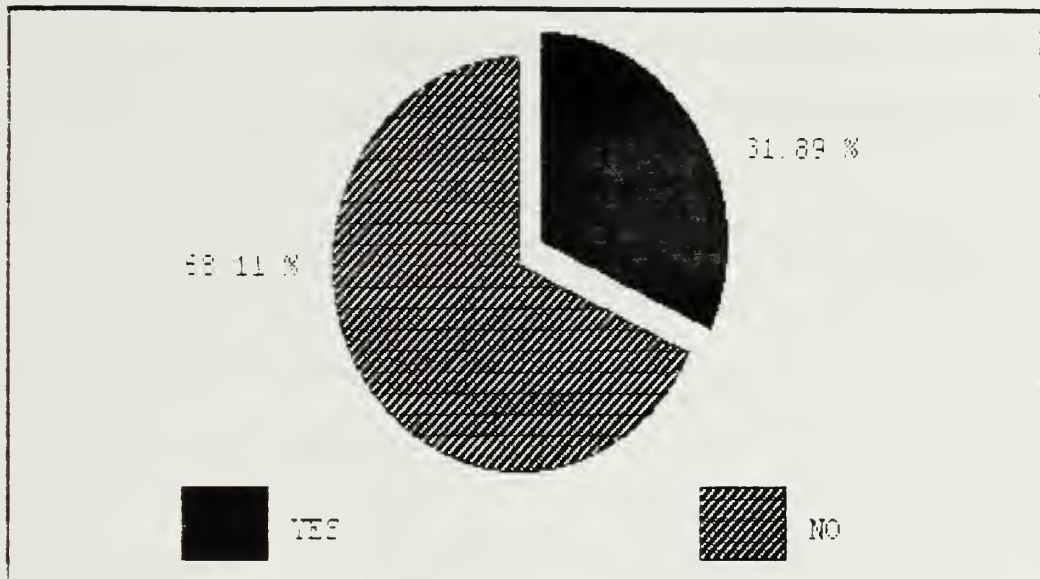


Figure 3.21 Contractors Talking Their Way into Undeserved Compensation

The majority of the comments received could be grouped into three categories. These comments are shown below with the percent responding with like comments indicated:

- 1 "The Engineering Field Division (EFD) directed that compensation be given because the amount in question was too small to fight over" --- 74%
- 2 "I allowed the additional compensation in order to maintain good working relations with the contractor".-----43%
- 3 "The contractor found himself short on some previously negotiated changes, so I allowed a little extra" -----27%

F. TRAINING COURSE RECOMMENDATIONS

All respondents were asked to provide their opinion as to when particular courses should be offered. The question was worded as follows:

The following is a list of additional courses offered by the Officers' School or by qualified civilian institutions. From your experience, please indicate which, if any, of these courses should be offered to contract administrators prior to or during their construction contract assignments:

	<u>Prior to</u>	<u>During</u>
Construction Contract Modifications	—	—
Negotiation Workshops	—	—
Contract Law	—	—
Construction Cost Estimation	—	—
Delay and Disruption	—	—
Business Letter Writing	—	—
Construction Inspection	—	—

The courses "Facilities Support Contracts" and "Cost and Price Analysis" were inadvertently deleted from this list when the questionnaire was prepared; therefore, no recommendations for these courses were obtained. The results of this question are shown in Figure 3.22.

In addition to providing their opinions as to when particular courses should be offered, all respondents were also asked to provide their opinion as to the adequacy of the training they received prior to their assignment as a contract administrator. The question was worded as follows:

'The training you received prior to your contract construction assignment prepared you adequately for the administration of change-orders'.

Do you agree or disagree with this statement?

— Agree — Disagree

Comment: _____

The response to this question is shown in Figure 3-22.

Those who agreed with the premise that "the training they received prior to their contract-construction assignment adequately prepared them" for the administration of change-orders provided the following comments:

1. "The only way to learn this business is through on-the-job training. The cost of the mistakes is the price of training"-----63%
2. "There is no better teacher than experience" -----48%
3. "We have too few people and too little time for training"-----31%

Those who disagreed with the premise provided the following comments:

1. "More emphasis must be placed on cost estimation"-----84%
2. "Negotiation techniques cannot be taught by watching a movie" (They are referring to negotiation techniques taught during the basic Contract Administration and Management course)-----61%
3. "More training in network (CPM) analysis is needed"-----46%

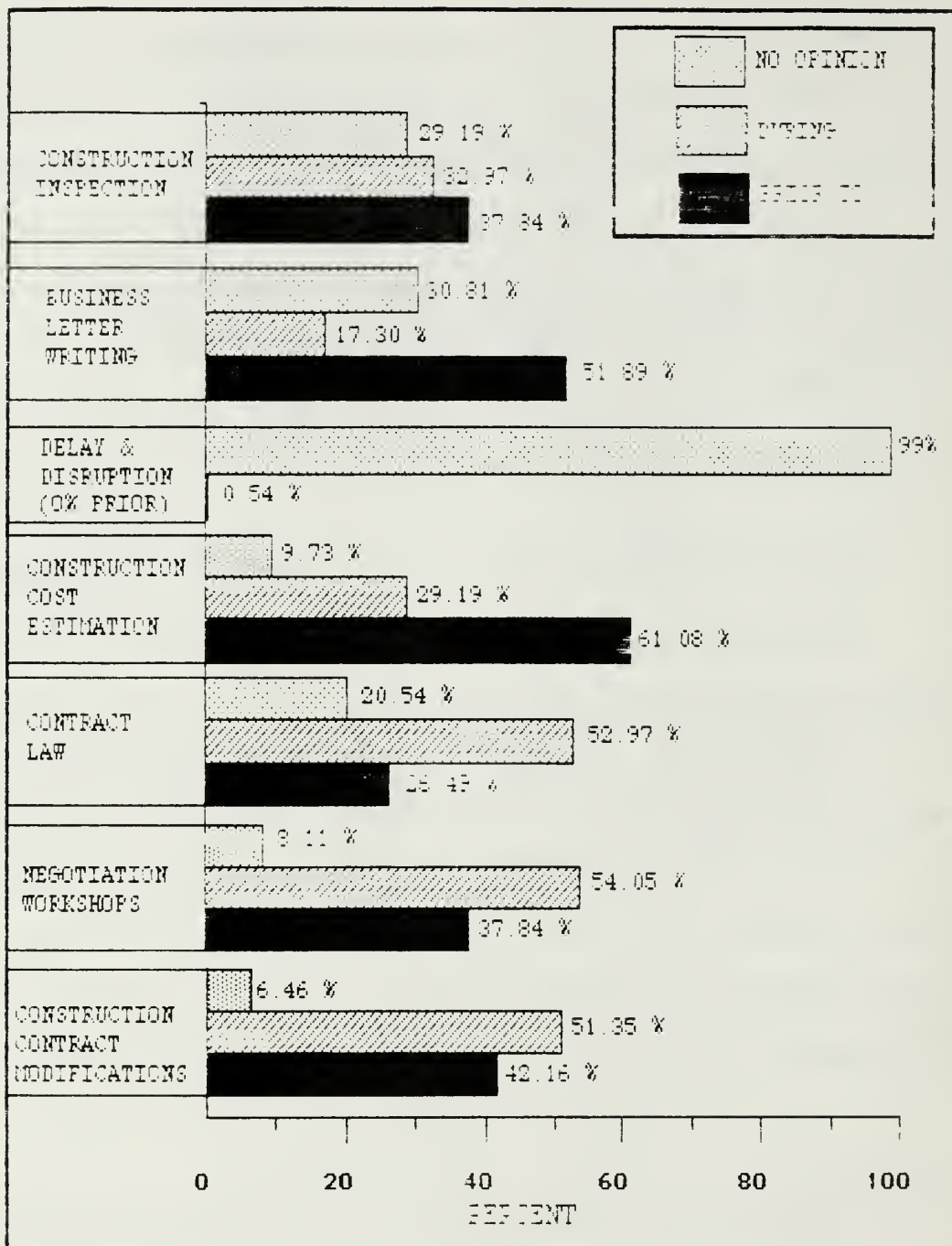


Figure 3.21 Course Recommendations

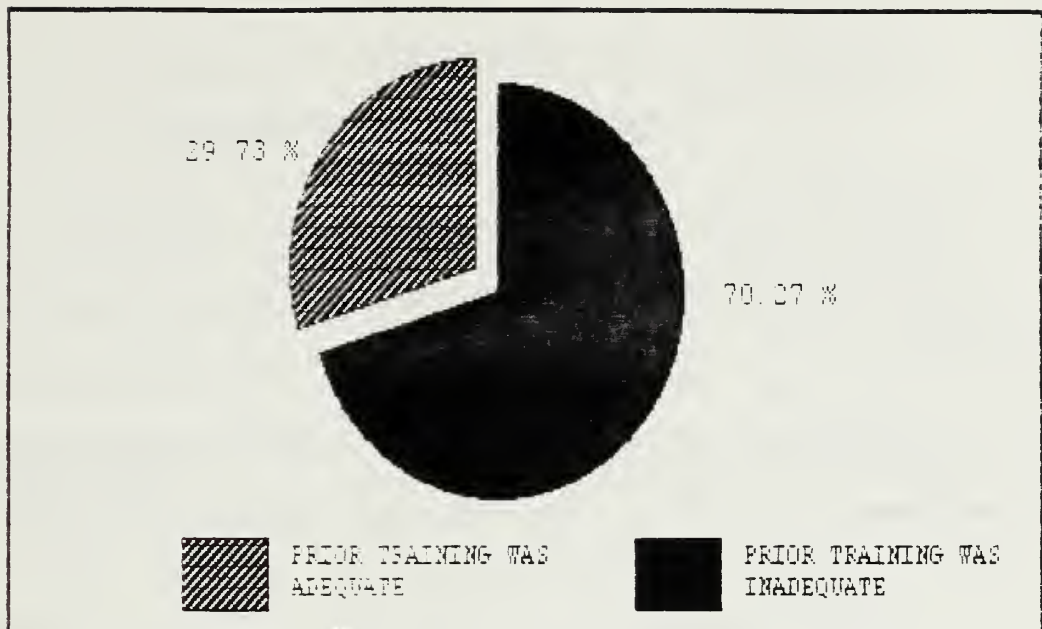


Figure 3-22 Training Received Prior to Assignment

5 SUMMARY

This chapter introduced the data generated from the distributed survey. In total, this data represents the summary of the attitudes and beliefs of NAVFAC junior-officer contract administrators as to the current state of training and cost growth in Navy contract construction. The next chapter provides an analysis of the survey responses from the viewpoint of the thesis objectives described in Chapter 1.

IV DATA ANALYSIS/INTERPRETATION

Chapter III provided a statistical and visual presentation of the data collected with the distributed survey questionnaire. This chapter provides an analysis of that data in support of the basic research question:

"Does there exist a relationship between the basic and specialized training received by ROICC's and AROICC's prior to and during their current assignments as contract administrators and the cost growth of Navy contract-construction projects"?

For cognitive continuity, data from Chapter III will be analysed and presented in the following format:

- A. THE RELATIONSHIP BETWEEN CHANGE-ORDER RATES & THE TIME DEVOTED TO CHANGE-ORDER ADMINISTRATION.
- B. INFLUENCE OF TRAINING/EXPERIENCE ON CONTRACT COST GROWTH
- C. ANALYSIS OF THE SUB-AREAS OF INVESTIGATION
 - 1. Basic Construction Contract Administration and Management
 - 2. Time Devoted to Change-Order Management
 - 3. Sequence of Course Attendance.
- D. EXISTING NAVFAC TRAINING POLICY
- E. COST-BENEFIT ANALYSIS
- F. SUMMARY

A THE RELATIONSHIP BETWEEN CHANGE-ORDER RATES & THE TIME DEVOTED TO CHANGE-ORDER ADMINISTRATION

The experience of the author is that change-order administration is a time consuming effort that requires diverse technical and administrative skills. The individual contract administrator must not only be effective in obtaining the best possible price for work performed or impact demonstrated, but must also exercise efficient management skills that release additional time to be used in efforts designed to avoid contract-cost growth through constructability reviews of pending construction projects and time for increased attention to quality construction through inspections directed at contractor compliance with existing contract plans and specifications.

From an individual perspective, one may argue that the time devoted to change-order administration and the overall change-order rate are a function of the immediate environment in which the contract administrator must operate. Environmental variables are numerous, but generally they include the following:

1. Office workload as reflected in the number and dollar value of contracts assigned to individual contract administrators.
2. The quality of the plans and specifications received from Architect/Engineers who ply their trade on a local basis.
3. The quality and quantity of construction-inspection personnel assigned to assist the contract administrator in performing daily construction inspection.

4 The organizational structure and administration policies of the individual construction offices.

One may also argue that these variables exist in varying degrees at all contract-construction offices and in the majority of cases are beyond the control of the individual contract administrator. When the population is taken as whole, these variables tend to be reduced to a constant.

If one agrees with the assumption that the environmental variables are a constant over the entire population and non-controllable, then one can logically assert that the administrative and technical skill of the individual contract administrator is the controllable variable that has the most influence on contract-construction cost growth.

The author has observed that the greater the administrative and technical skills of the individual contract administrator, the greater the efficiency and effectiveness demonstrated in change-order administration. The research data presented in Chapter III measured efficiency by the reported total time devoted to the change-order process and measured effectiveness by the aggregate change-order rate reported on all active contracts within the individual administrator's control.

As a means of establishing a relationship between efficiency and effectiveness as defined above, the individual change-order rates summarized in Table 3.3 were compared to the reported time devoted to change-order administration by the total population as shown in Figure 3.9. This relationship is charted and shown in Figure 4.1. It is interesting to observe that the relationship between efficiency and effectiveness holds true for the entire population, i.e., the greater the efficiency, the greater

the effectiveness. It is also interesting to note that the relationship appears to reach an asymptote at a change-order rate of approximately 2.4%. The author suggests that this value represents the contribution to the change-order rate of the uncontrollable environmental factors mentioned above.

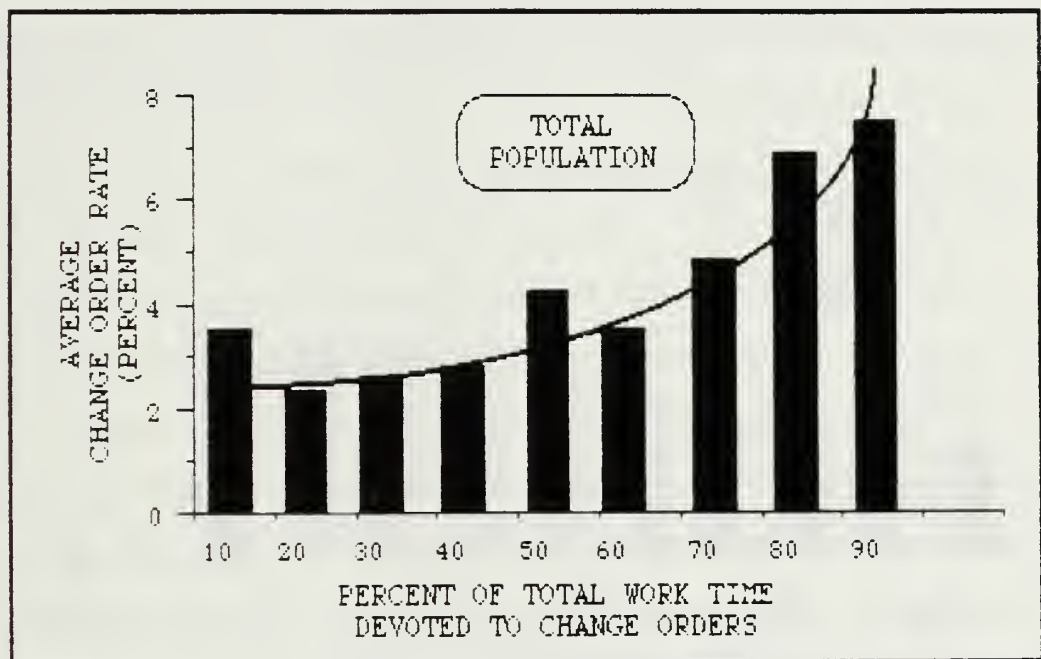


Figure 4.1 Change-Order Rates vs. Administration Time

Now that the relationship between contract-cost growth and individual contract-administrator skill has been determined, the remaining question is: "How much of that skill is a result of on-the-job training and how much is the result of formal training-course attendance"?

B INFLUENCE OF TRAINING AND EXPERIENCE ON CONTRACT COST GROWTH

The great majority of all respondents to the questionnaire had no previous experience in contract-construction administration (93%). This is to expected given the target population of all-junior officers. There is certain life experience, however, unique to the career patterns of Civil Engineer Corps Officers obtained through job assignments that include Public Works Administration; Construction Battalion duty; Staff Civil Engineer assignments at major shore and operational commands; and advanced educational opportunities such as post graduate education. For the purpose of this discussion, "life experience" obtained during the contract-construction assignment is referred to as on-the-job training. This on-the-job training would be most significant for the Ensigns as their contract-construction administration assignment is their first life experience in the Civil Engineer Corps community. Figure 4.2 is a graphical representation of the relationship between the average time devoted to change-order administration and the number of formal training courses completed by each demographic group. The effect of life experience is represented by the differences between demographic groups in each level of course completion. The effect of formal training is represented by the difference in each individual group as the number of formal training courses increases. For example, at a formal training-course-completion level of one course, the average Ensign devotes 75% of total time to change-order administration. The average LTJG devotes 70% of total time and the average LT devotes 66.3% of total time to change-order administration. These differences can, in the opinion of the author, be attributed to

differences in the quantity of life experience held by each group. Conversely the average Ensign with one course completed uses 75% of total time for change-order administration as opposed the average Ensign with two courses completed, who uses 68.8% of total time for change-order administration. This reduction is demonstrated by each demographic group and can, in the opinion of the author, be attributed to a positive effect of formal training. This same relationship is shown in Figure 4.3 as a function of average change-order rates.

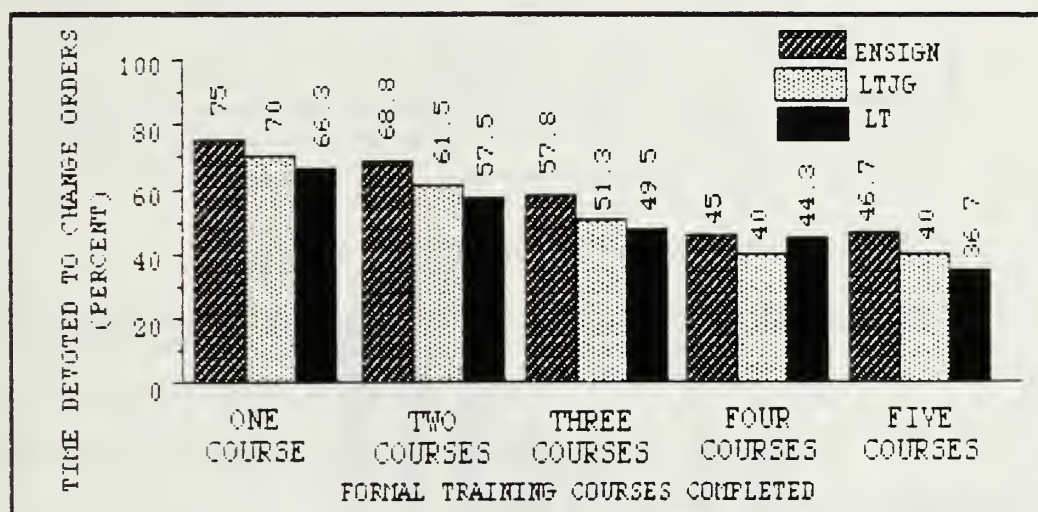


Figure 4.2 Change-order time as a function of Course completion

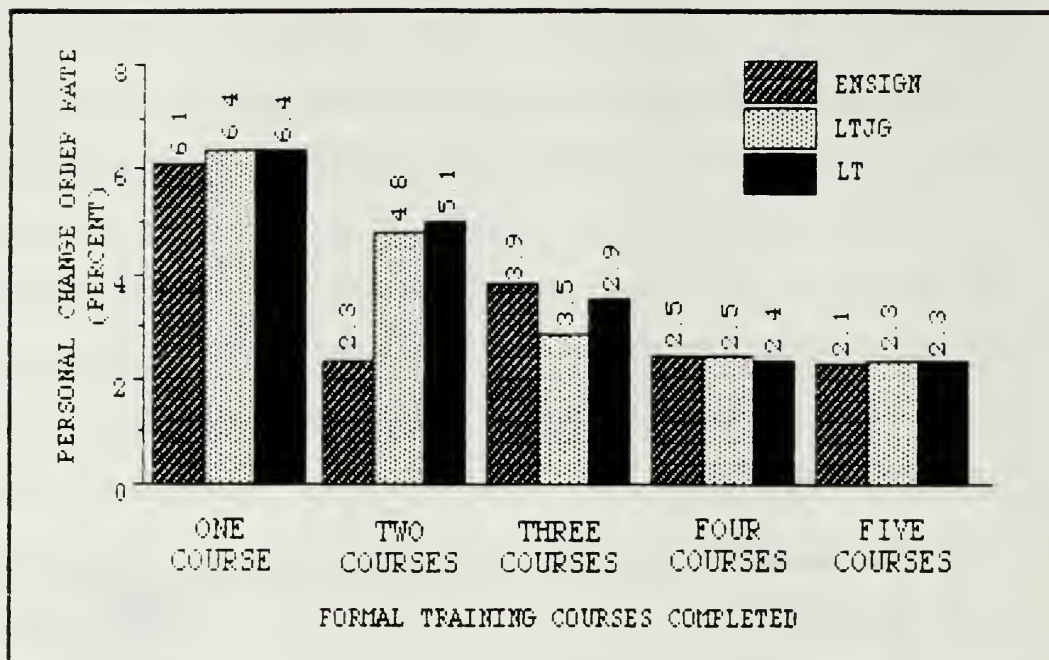


Figure 4.3 Change-Order Rates as a Function of Course Completion.

C. ANALYSIS OF THE SUB-AREAS OF INVESTIGATION.

1. Basic Construction-Contract-Administration-and-Management

The first sub-area of investigation asked the following question. "Does the basic one-week Construction Contract Administration and Management course adequately prepare the junior officer for management of construction contract cost growth?" This course is the only required course for all contract administrators, with 94% of the total population surveyed reporting completion.

One way of answering this question is to compare the percentage of topics in the course related to change-order administration with the reported percentage of total contract-construction administration time devoted to the change-order process in the field. A list of the topics

presented in this course is shown in Appendix D. Topics that focus directly on change-order administration include:

- a. Contract Modifications
- b. Price Negotiation
- c. Cost Principles
- d. Time Extension Workshop
- e. Pricing Workshop
- f. Negotiation Techniques

These topics account for 26% of the total number of topics presented. This compares to the total population surveyed, who reported an average of 70.4% of total time devoted to change-order administration. This data is summarized from Table 3.5 and shown in Figure 4.4.

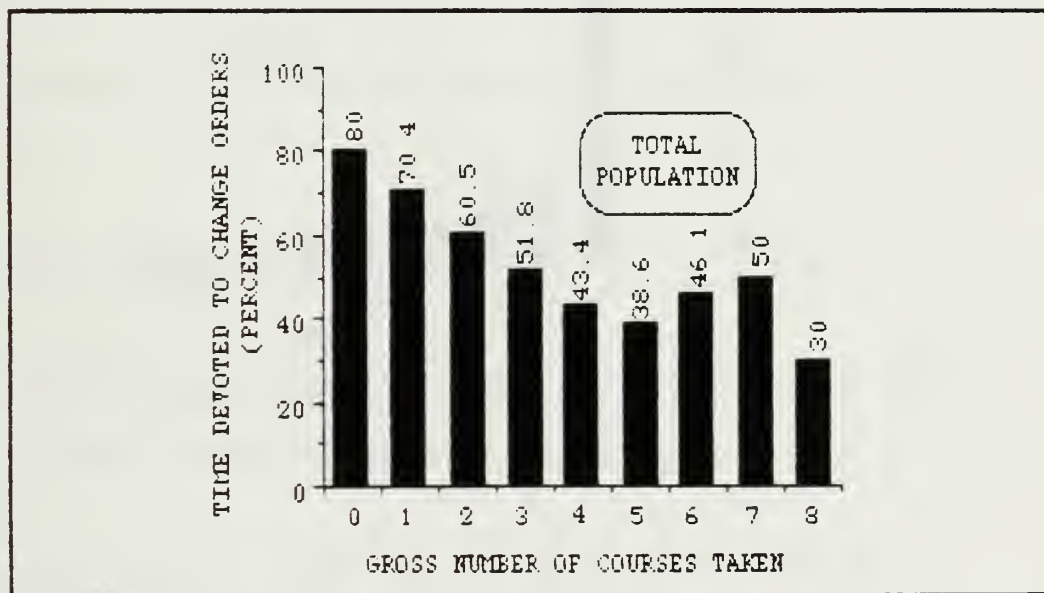


Figure 4.4 Time Devoted to Change-Orders Compared to the Number Courses Taken

Another means of answering this question is to compare the change-order rates reported by respondents with this one course completed to the

change-order rates reported by respondents with two courses completed. For the purpose of this comparison, it is assumed that the second course taken focuses directly on an area of change-order administration. The average change-order-rate for the total population completing only the basic Contract-Construction-Administration-and-Management course is 6.3%. This compares to 4.6% when one more course in a change-order-related area is taken. This data is shown in Figure 4.5.

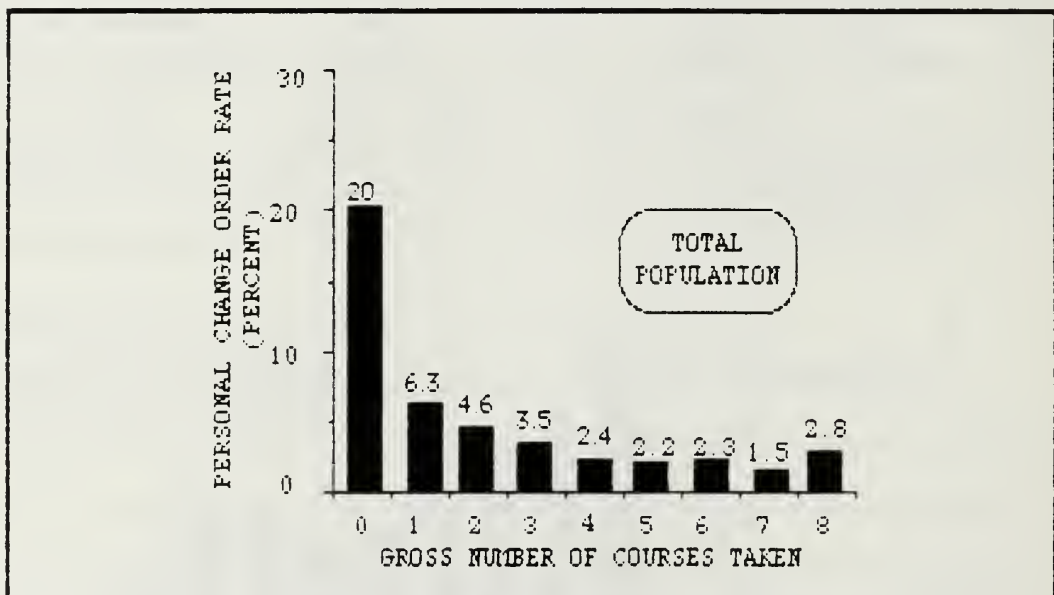


Figure 4.5 Change-Order-Rates Compared to The Number of Courses Taken

These two comparisons of the basic Contract-Construction-Administration-and-Management course with data obtained from the field leads the author to suggest that this basic one week course does not adequately equip the individual contract administrator with the requisite skills for effective and efficient change-order administration.

2. Time Devoted to Change-Order Management

The amount of time devoted to change-order management as a percentage of the total time devoted to contract-construction administration is shown for each demographic group in Figures 3.6-3.9. This data is then summarized in Table 3.5. The average time for the total population was 53.95%. This figure varies significantly with the number of formal training courses completed and the life experience of the individual contract administrator, with averages as high as 60% for Ensigns with no formal training to averages of 36.6% for Lieutenants with five courses completed.

3. Sequence of Course attendance

Examination of Figure 3.21 reveals that the majority of respondents recommended that the following courses be taken prior to the contract-construction assignment.

- a. Construction Cost Estimation-----61.06%
- b. Business Letter Writing-----51.89%

The following courses were recommended by the respondents to be taken at some time during the contract-construction assignment:

- a. Negotiation Workshops-----54.05%
- b. Contract Law-----52.97%
- c. Construction Contract Modifications-----51.35%

The respondents were split on the Construction-Inspection courses with 32.97% recommending attendance during the assignment and 37.84%

recommending attendance prior to the assignment. The respondents expressed no significant opinions about the Delay-and-Disruption course.

D. EXISTING NAVFAC TRAINING POLICY

The literature search revealed that the basic Construction-Contract-Administration-and-Management course is the only course that is required to be taken by contract-construction administrators. All other courses listed in this paper are optional, and attendance is left to discretion of the individual contract-construction offices. There is no written policy concerning a recommended sequence of course attendance. The only written training policy concerns the Contracting Authority Warranting Program which concentrates on procurement professionals responsible for executing Naval Facilities Engineering Command contracting authority. The study of this program is beyond the scope of this paper.

The perception that the author received during personnel interviews was that contract administrators are expected to learn the tools of their trade through on-the-job training experiences and that the cost of mistakes is the cost of training. The author takes issue with this perception based on the following simple and conservative cost benefit analysis.

E. COST-BENEFIT ANALYSIS

The highest variable costs associated with sending a contract administrator for one week of training would result from an individual's travelling from the East coast of the United States to the Civil Engineer Officer School or the Naval Facilities Contract Training Center, both located

at Port Hueneme, California. The estimated variable cost breakdown is as follows:

Round trip transportation	\$500.00
Seven days per diem @ \$80.00 per day	\$560.00
Misc. school direct costs	\$500.00
	<hr/>
Total cost for one week of attendance	\$1560.00

In keeping with the simplistic nature of this cost/benefit discussion, additional opportunity costs such as employee salaries, retirement benefits, additional personnel, etc., have not been included in the presentation of costs. The primary purpose of this presentation is to alert the reader that a significant cost/benefit ratio exists. Further refinement would be a rewarding investigation and should provide sufficient justification for funding and personnel. Further refinement here is beyond the scope of this study.

The average change-order rate for the total population with one formal course completed (the basic contract-construction administration and management course) is 6.3%. When one additional course is added, this rate is reduced to 4.6%. This is a reduction of 1.7 percentage points. The reported average dollar value of active contracts being administered by an individual is \$13.65 million. The reduced average (removing the highest and lowest reported dollar values) is \$10.8 million.

Cost growth with one course (6.3% of \$10.8 million)	\$680,400
Cost growth after one additional course (4.6% of \$10.8 million)	\$496,800
	<hr/>
Projected savings	\$183,600

This simple calculation gives a ratio of benefits exceeding costs of 117.7 to 1. It is important to note that with a contract responsibility of only \$3.00 million, which includes over 96% of all contract administrators, this same calculation yields a benefit-to-cost ratio of 32.7 to 1. The same basic calculation can be performed for three, four, and five additional courses. An interesting finding of this study was that after the third additional course, the reduction in change-order rate percentage points becomes insignificant. This can be seen in Figure 4.5 and most likely represents the impact of the environmental variables described earlier, which are beyond the control of the individual administrator.

F. SUMMARY

This chapter contained the analysis of significant portions of the data obtained through the survey questionnaire, personnel interviews, and the literature search. The next chapter uses this analysis as a basis for some conclusions and recommendations about the training of contract-construction administrators.

V. CONCLUSIONS AND RECOMMENDATIONS

The previous four chapters contained the background, problem description, data, and analysis of the effect of formal training on the contract-construction change-order process. This chapter contains conclusions about the impact of formal training on contract-construction cost growth and makes recommendations on how the Naval Facilities Engineering Command can reduce cost growth through increased training opportunities for junior officers performing duty as Resident and Assistant Resident Officers in Charge of Construction.

A CONCLUSIONS

After reviewing the information in the previous four chapters, the following conclusions are made about effect of formal training on contract-construction cost growth and the existing policy of the Naval Facilities Engineering Command (NAVFAC) towards the training of Resident and Assistant Resident Officers in Charge of Construction (ROICC's/AROICC's).

1. The current NAVFAC policy does not require any formal training of junior officers serving in ROICC and AROICC assignments beyond the basic one-week Contract-Construction-Administration-and-Management course.
2. The Contract-Construction-Administration-and-Management course does not adequately prepare the junior officer for efficient and effective administration of the change-order process.

3. Less than 50% of all contract-construction offices have an active training program
4. Management emphasis on the use of change-order-rates as a control mechanism in the evaluation of the performance of contract administrators should be improved
5. Junior officer RDICC and ARDICC personnel are generally dissatisfied with the quantity and quality of training they receive prior to their assignments.
6. Constructability reviews account for less the 5% of the work performed by RDICC's and ARDICC's, yet have the potential of reducing contract cost growth by as much as 59%. There seems to be plenty of time administer the change-order process, but little time to avoid it. No accountability for constructability reviews currently exists.
7. Formal training beyond the basic Contract-Construction-Administration-and-Management course significantly reduces contract cost growth. Highly conservative cost/benefit analysis shows that benefits exceed costs by 39:1.
8. Formal training courses that exceed three to four in number beyond the basic administration course result in no significant reduction of contract cost growth.
9. A training program such as that established for the Contracting Authority Warranting Program should be established for contract-construction administrators.

B. SHORT-TERM RECOMMENDATIONS

These recommendations for improving the quantity of formal training could be implemented quickly:

1 Basic Course Expansion

The basic Contract Construction Administration and Management course should be expanded to include the current course syllabus developed

appropriate penalties for delays incurred by non-response. The level of detail required should be specified and be identical to that required of the contractor.

C. LONG-TERM RECOMMENDATIONS

1. Estimating Divisions

Cost-estimating divisions where currently existing should be expanded as necessary to meet office demands for accurate and timely cost-estimation assistance. The latest computerized cost-estimation data bases should be available in these divisions. In offices where the workload cannot justify a separate division, consideration should be given to contracting out this function.

2. Personal Qualification Standards

A program similar to the current Contracting-Authority Warranting Program should be established for contract-construction administration. This program would preclude the assignment of Ensigns to ROICC or ARDICC duty and would require that LTJG's and LT's complete the requirements within eighteen months of assignment. Personnel would be required to complete any three topics from the following list:

- a. Cost Estimation
- b. Negotiation Workshops
- c. Contract Law
- d. Business Communication (Written and Oral)
- e. Construction Inspection Techniques
- f. Computerized Network Methods (CPM,PERT)

for the Negotiation Workshop and Cost Estimation courses. A professional course in Business Communication (Oral and Written) should also be added. The author's experience agrees with that of Fielden and Dulek [Ref. 2] and suggests that the "hamby-pamby, beat-around-the-bush organizational pattern typical of college writing courses" does not prepare the average contract administrator for the business requirement that thoughts and ideas be presented "directly, efficiently, and effectively." Recommended texts are listed as References 2 and 3.

2. Construction-Contract Modification

Issue a NAVFAC policy statement requiring that all ROICC's and ARDICC's attend the Construction-Contract Modification course within 12 months of reporting for duty.

3. Training Programs

Each Engineering Field Division (EFD) should issue a policy statement on the subject of training programs. This policy statement should include a requirement for the establishment of a written program that would be reviewed at the EFD.

4. Funding of Additional Training Courses

Shift the funding responsibility from the local ROICC offices to the Engineering Field Divisions.

5. Architect/Engineer Cost Estimating Support

Current Architect/Engineer selection boards should emphasize the importance of a timely response to requests for cost estimates when a design related change has occurred. The definition of a timely response should establish three working days as an appropriate standard with

3. Constructability Reviews

A separate reviewing authority for all construction contracts must be established at a level appropriate for each contracting location. This establishment would be appropriate for large contracting locations such as San Diego, Norfolk, Charleston, etc. At smaller locations, the reviewing authority should be contracted out if additional personnel cannot be justified to perform the reviews.

APPENDIX A

CHANGE-ORDER QUESTIONNAIRE

1. The following is a list of subject areas where formal training is available either at Port Hueneme or by a variety of civilian institutions. Please mark those subject areas in which you have received formal training PRIOR TO or DURING your current assignment. (This question refers to formal training you have received after your college education and after the basic school at Port Hueneme.)

Prior to	During	
<input type="checkbox"/>	<input type="checkbox"/>	Contract Construction Admin & Mgmt
<input type="checkbox"/>	<input type="checkbox"/>	Construction Contract Modifications
<input type="checkbox"/>	<input type="checkbox"/>	Negotiation Workshops
<input type="checkbox"/>	<input type="checkbox"/>	Contract Law
<input type="checkbox"/>	<input type="checkbox"/>	Construction Cost Estimation
<input type="checkbox"/>	<input type="checkbox"/>	Various Construction Inspection Courses
<input type="checkbox"/>	<input type="checkbox"/>	Business Letter Writing
<input type="checkbox"/>	<input type="checkbox"/>	Delay and Disruption
<input type="checkbox"/>	<input type="checkbox"/>	Facility Support Contracts
<input type="checkbox"/>	<input type="checkbox"/>	Cost and Price Analysis

2. What is the approximate dollar value of the active construction contracts you are currently administrating? \$_____

3. What is the change-order rate your office currently experiences on construction contracts?

_____ % ☐ Not sure

4. What is your own change-order rate on contracts you are administrating?

_____ % ☐ Not sure

5. An average change-order begins with the identification of the changed condition and ends with a modification to the construction contract. Between these two points, the time you devote to administrating the

change-order is divided in varying degrees among funding requests, cost estimation, site visits, various pieces correspondence, negotiations, and the final write-up

Of all the time you devote to contract administration, what is your estimate of the percentage of your time devoted to change-orders?

- | | |
|------------------------------|-------------------------------|
| <input type="checkbox"/> 10% | <input type="checkbox"/> 60% |
| <input type="checkbox"/> 20% | <input type="checkbox"/> 70% |
| <input type="checkbox"/> 30% | <input type="checkbox"/> 80% |
| <input type="checkbox"/> 40% | <input type="checkbox"/> 90% |
| <input type="checkbox"/> 50% | <input type="checkbox"/> 100% |

6. Of all the time you devote to contract administration, what is your estimate of the percentage of your time devoted to constructability reviews?

- | | |
|---------------------------------------|------------------------------|
| <input type="checkbox"/> less than 5% | <input type="checkbox"/> 50% |
| <input type="checkbox"/> 10% | <input type="checkbox"/> 60% |
| <input type="checkbox"/> 20% | <input type="checkbox"/> 70% |
| <input type="checkbox"/> 30% | <input type="checkbox"/> 80% |
| <input type="checkbox"/> 40% | <input type="checkbox"/> 90% |

7. From your experience, please rank the following components of an average change-order in increasing order from the most time required to the least time required.

(1= most time required)

- | | |
|---------------------|-------------------------------|
| ____ Negotiation | ____ Cost Estimation |
| ____ Correspondence | ____ Construction Site Visits |
| ____ Final Write-up | ____ Funding Requests |

8. Which areas of a change-order do you find the most difficult to estimate? (please rank in order from most to least difficult....1= most difficult)

- | | |
|----------------------|-----------------------------------|
| ____ Labor costs | ____ Material costs |
| ____ Equipment costs | ____ Field & Home Office Overhead |
| ____ Scope of work | |

9. Does your office have a separate division dedicated solely to providing change-order estimates at your request?

- ☐ Yes ☐ No (Skip to question 13)

10. How often do you feel that the estimates generated by this division are more accurate than your own?

- ☐ All the time ☐ Most of the time
☐ Occasionally ☐ Seldom

11. If you were the boss and had to choose between hiring an additional contract administrator or hiring additional construction estimators, what would be your decision?

- ☐ Hire the additional contract administrator
☐ Hire the additional estimators

12. Do you feel that your estimating division is understaffed or overstaffed?

- ☐ Understaffed ☐ Overstaffed

13. When a design coded change-order has occurred, do you request that the Architect/Engineer (A&E) provide you with an estimate of the changed condition?

- ☐ All the time ☐ Most of the time ☐ Seldom
☐ Never

14. From your experience, what is the greatest problem with requesting an estimate from an A&E?

15. Does your office have a training program for contract administrators?

- ☐ Yes ☐ No ☐ Not sure

16. One of the basic assumptions of "on-the-job training" is that we learn by our mistakes. Looking back on your experience as a change-order estimator and negotiator, do you now feel that some of your contractors were over compensated on legitimate change-orders?

- ☐ Yes ☐ No (Skip to question 18)

Comments, if any:

17 From your experience, how many of these instances of over-compensation could have been avoided with sufficient training prior to your current assignment?

☐ All ☐ Most ☐ Some ☐ None

18 Again, looking back at your experience as a contract administrator, do you feel that some of your contractors have "talked" their way into receiving compensation for changed conditions that were not the responsibility of the government?

☐ Yes ☐ No

If yes, please elaborate

19 The following is a list of additional courses offered by the Officers School or by qualified civilian institutions. From your experience, please indicate which if any, of these courses should be offered to contract administrators prior to or during their construction contract assignments.

	Prior to	During
Construction Contract Modifications	<input type="checkbox"/>	<input type="checkbox"/>
Negotiation Workshops	<input type="checkbox"/>	<input type="checkbox"/>
Contract Law	<input type="checkbox"/>	<input type="checkbox"/>
Construction Cost Estimation	<input type="checkbox"/>	<input type="checkbox"/>
Delay and Disruption	<input type="checkbox"/>	<input type="checkbox"/>
Business Letter Writing	<input type="checkbox"/>	<input type="checkbox"/>
Construction Inspection	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>

20 "The training you received prior to your contract construction assignment prepared you adequately for the administration of change-orders" Do you agree or disagree with this statement?

☐ Agree ☐ Disagree

Comment, if

any: _____

21. For the purposes of this question, assume that the average change-order rate for all construction contracts you administrate is 10%.

a. From your experience, what is your estimate of the portion of that 10% that can be attributed to your on-the-job training errors and resulting in the contractor being over compensated?

_____ %

b. What is your estimate of the portion of that 10% that can be attributed to errors in the plans and specifications that could have been identified prior to bidding by a thorough constructability review?

_____ %

22. An independent estimate is defined as an estimate that is determined using the identified scope of the changed condition and various aids to estimation.

How often do you use the contractor's estimate as an aid or guide in conducting your own estimate? (Be honest!)

☐ All the time

☐ Most of the time

☐ Some of the time

☐ Never

Background Questions

1. Which Engineering Facilities Division (EFD) or Officer in Charge of Construction (OICC) does your office report to?

2. What is your position in your office (Resident Officer in Charge of Construction (ROICC), Assistant ROICC, Zone Manager, etc.)?

3. How long have you held this position? (Months)

4. What is your current paygrade?

☐ 0-1

☐ 0-2

☐ 0-3

☐ 0-4

5. Including yourself, how many Civil Engineer Corps Officers are in your office?

6. How many civilian (GS) contract administrators are in your office?

7. Is this your first construction contract administration assignment?

☐ YES

☐ NO-- previous experience was as follows:

Thank you for your assistance in this research effort.

Please return this questionnaire in the enclosed self addressed envelope.

If the envelope has been misplaced, please send this questionnaire to:

LCDR Mark D. Claussen, CEC, USN
SMC #1853, NPS
Monterey, California 93943

APPENDIX B

ACRONYMS AND DEFINITIONS

1. Acronyms

The following acronyms are used in various places throughout the text and have been summarized below to provide a location for central reference purposes

<u>A/E</u>	- Architect/Engineer
<u>AROICC</u>	- Assistant Resident Officer in Charge of Construction
<u>CEC</u>	- U.S. Navy Civil Engineer Corps
<u>CECOS</u>	- Naval School, Civil Engineer Corps Officers
<u>EFD</u>	- Engineering Field Division
<u>NAVFAC</u>	- Naval Facilities Engineering Command
<u>NAVFAC P-68</u>	- Contracting Manual
<u>OICC</u>	- Officer in Charge of Construction
<u>ROICC</u>	- Resident Officer in Charge of Construction

2. Definitions

AROICC- Assistant Resident Officer in Charge of Construction. Within the NAVFAC system this term refers to a Civil Engineer Corps Officer who directly administers construction contracts. Within the context of this study the term AROICC refers to both military and civilian personnel who directly administer construction contracts.

OICC- Officer in Charge of Construction. Usually a senior Civil Engineer Corps Officer with delegated contracting authority. By virtue of that

authority he is responsible for the success of all contracting actions he issues. The OICC usually prepares personnel performance evaluations within his jurisdiction. The OICC also can recommend denying a contractor an award based on his determination that the contractor is not responsible.

Construction Contract Change Order- The legal instrument by which both parties to a construction contract modify in any way the rights or obligations established by the basic contract.

Change Order Negotiations- a decision-making process whereby agreement by both parties on the modification of the original contract is reached based on a mutual understanding of the obligations and rights of both the Government and the contractor. Negotiations are characterized by presentation of the position of the participating parties which may be widely divergent or closely aligned and the exertion of pressures, influences, persuasion, and compromise to meet on agreeable common ground.

Contract Construction Administration- All the actions that the Government must take with respect to interfacing with a contractor after the contract has been awarded until the material, service, or facility has been delivered, accepted and paid for and the contract officially closed out.

APPENDIX C

SECTION 1.4.1 THROUGH 1.4.9 OF THE NAVFAC CONTRACTING MANUAL P-66 DATED FEBRUARY 1985

The information contained in this Appendix is copied directly from the Naval Facilities Engineering Command Publication P-66.

Part 4. Contracting Authority

1-401 CONTRACTING OFFICER AUTHORITY. (1.6, 4.101)

(a) Responsibility for Navy Procurement is vested by statute in the Secretary of the Navy. The Secretary has, by the Navy Acquisition Regulations Supplement, NAVMAT P-4202, and other instruments, delegated this responsibility to each NAVMAT Command Commander "for procurement of supplies and services under the technical cognizance of his Command." Federal Acquisition Regulation Subpart 1.6 identifies the authority and responsibilities of contracting officers. Section I Part 3 of this manual identifies the areas assigned to the Commander, Naval Facilities Engineering Command for technical cognizance.

(b) A contracting officer may exercise only that authority specifically delegated and must receive clear instructions in writing, regarding the extent of and the limits to such authority. Appointment orders (warrants) shall be available to contractors, agency personnel and other interested parties. Contracting officers shall be appointed by a "Certificate of Appointment," Standard Form 1402, which shall state the authority granted and any limitations other than those provided by law or regulation. (See Appendix D.) Warrants may provide delegations only as authorized below.

(c) Only contracting officers are authorized to enter into, modify and/or terminate contracts. They also issue final decisions on contract disputes, chair selection and negotiation boards, and approve actions such as bid irregularity disposition, business clearances, board reports and ensure compliance with the terms of the contract. Procurement statutes and regulations set forth other functions which may be performed only by appropriately warranted contracting officers.

(d) Appointments of contracting officers remain in effect as long as appointees are assigned to the position stated on the warrant, unless sooner terminated by the appointing Officer, his successor or COMNAVFACEGCOM.

1-402 DELEGATION OF AUTHORITY TO APPOINT CONTRACTING OFFICERS

(a) EFD Commanders and independent OICC's are hereby delegated authority to appoint Contracting Officers for their Commands for the award and administration of following types of procurement actions:

(1) Sealed bid contracts (including civil works subcontracts) for construction, repair, or alteration.

(2) Sealed bid purchase contracts for specialized materials and equipment not available through regular supply channels.

(3) Sealed bid contracts for demolition and removal of buildings and structures.

(4) Sealed bid contracts for the repair, alteration, overhaul of Government-owned equipment, including motor vehicles; construction; weight-handling, materials-handling, and railroad equipment; and all other types of transportation equipment and allied appurtenances.

(5) Sealed bid contracts for the procurement of commercial ground transportation services.

- (6) Sealed bid contracts for maintenance services.
- (7) The slating, selection and negotiation of A-E and E-S contracts.
- (8) Contracts for utility services.
- (9) Competitive contracts which are awarded on the basis of other than sealed bids but as the result of full and open competition.
- (10) Contracts for timber sales and other forestry management services.
- (11) "In scope" change orders to the foregoing contracts.
- (12) Contracting Officer "Final Decisions" on disputes arising under the foregoing contracts. When a dispute involves a time extension, the value of potential liquidated damages shall be included in determining the amount in disputes. (See Section VII, Part 4)
- (13) Contracting Officer "Final Decisions" terminating contracts for default when the contractor has abandoned the work or the contract value does not exceed \$50,000. (See Section VII, Part 6)
- (14) Resolution of irregular bids are related actions. (See Section 4, Parts 4 and 5)
- (15) Delivery orders under indefinite quantity contracts.
- (16) Single source contracts and proprietary specifications valued at \$100,000 or less. (See 1-405)
- (17) "8a" negotiated contracts.

(b) Actions taken by contracting officers shall be executed in the following form, as appropriate:

John J. Jones
CDR, CEC, U.S. Navy
Public Works Officer
Contracting Officer

John J. Jones
Director, Contracts Division
Contracting Officer

1-402.1 LEVELS OF CONTRACTING OFFICER WARRANTS. The following VII levels of contracting officer warrants may be issued to qualified military and civilian personnel:

Warrant Levels (I)

Type Contract (2)	I (3)	II (4)	III (5)	IV	V	VI	VII
1. Construction, Repair, Alter.	Unlimited	\$5 Mil	\$1 Mil	\$500,000	\$100,000	\$25,000	\$2,000
2. Purchase	Unlimited	\$5 Mil	\$1 Mil	\$500,000	\$100,000	\$25,000	\$2,500
3. Demolition	Unlimited	\$5 Mil	\$1 Mil	\$500,000	\$100,000	\$25,000	\$2,000
4. Transp. Maint.	Unlimited	\$5 Mil	\$1 Mil	\$500,000	\$100,000	\$25,000	\$2,500
5. Transp. Service	Unlimited	\$5 Mil	\$1 Mil	\$500,000	\$100,000	\$25,000	\$2,500
6. Maint. Service	Unlimited	\$5 Mil	\$1 Mil	\$500,000	\$100,000	\$25,000	\$2,500
7. A-E & E-S							
Slate & Selec & Neg	Unlimited	\$500,000	\$200,000	\$200,000	\$100,000	N/A(6)	N/A
8. Utility (7)	Unlimited	\$5 Mil	\$1 Mil	N/A	N/A	N/A	N/A
9. Competitive	Unlimited	\$5 Mil	\$200,000	\$100,000	\$100,000	\$25,000	\$2,000
10. Timber/Forestry	Unlimited	\$5 Mil	\$1 Mil	\$500,000	\$100,000	\$25,000	\$2,500
11. In Scope Changes	Unlimited	\$5 Mil	\$1 Mil	\$500,000	\$100,000	\$25,000	\$2,000
12. Final Decisions (8)	\$250,000	N/A	N/A	N/A	N/A	N/A	N/A
13. Default	\$50,000	N/A	N/A	N/A	N/A	N/A	N/A
14. Irregular Bids	Unlimited	N/A	N/A	N/A	N/A	N/A	N/A
15. Indel. Quantity	Unlimited	\$5 Mil	\$1 Mil	\$500,000	\$100,000	\$25,000	\$2,500
16. Single Source	\$100,000	\$75,000	\$50,000	\$50,000	\$25,000	\$25,000	\$1,000
17. "8A" Negotiated	Unlimited	\$5 Mil	\$200,000	\$100,000	N/A	N/A	N/A

FOOTNOTES to 1-402.1:

- (1) The dollar value and types of contract authority shown for each of the seven levels of warrants are the maximum which may be delegated. Lesser amounts within a level may be delegated as deemed appropriate by the appointing authority (See Appendix D-3, also see 1-402.4).
- (2) See 1-402(a), subparagraphs 1-18 for a description of the type of contract authority referred to by the short title in this column.
- (3) Level I warrants normally are limited to Commanders, Deputy Commanders, and senior Contracts Division personnel at the EFD or at independent OICC's with NAVFAC Counsel.
- (4) Level II warrants normally are limited to senior procurement officers and Contracts Division personnel at the EFD and to field OICC's with NAVFAC counsel and contracts personnel (GS-1102) at grade 13 or higher.
- (5) Level III-VII warrants are appropriate for delegation to the EFD Contracts Division staff, field 1102's and officers in the field, as justified by their positions and qualifications.
- (6) "N/A" indicates "not appropriate for delegation."
- (7) Utility contract actions, when the price is established by a regulatory body, may be delegated to EFD Code 11 personnel meeting the qualification requirements in 1-402.2 for Level V.
- (8) With the exception of the EFD Executive Officer, authority to execute Final Decisions may not be delegated outside of the Contracts Office. Dependent on personal qualifications, the Contracts Division Principal Assistant for Claims will normally be issued a limited warrant for Level I (13) which authorizes settlement of disputes or execution of Contracting Officer Final Decisions for the amount indicated. This authority may not be delegated below the level of the EFD.

1-402.2 Qualification Requirements for Contracting Officer Warrants

(a) The criteria set forth below are the basic qualification requirements for NAVFAC Contracting Officer authority:

(1) LEVEL VII (\$2,500/\$2,000)

- a. Experience Six months of Government contracting experience.
- b. Education High School Graduate.
- c. Training CECOS Construction Contract Administration course or Defense Small Purchase Course or Management of Defense Acquisition Contracts.
- d. Duties The individual regularly dedicates a significant portion of his/her time to small purchase procurement matters.

(2) LEVEL VI (\$25,000)

- a. Experience One year of Government contracting experience.
- b. Education Same as Level VII.
- c. Training Satisfactory completion of two of the courses designated for Level VII.
- d. Duties Same as Level VII.

(3) LEVEL V (\$100,000)

- a. Experience Shall have two years of progressively complex Government contracting experience.
- b. Education Preferably an Associate's degree or two years college level specialized study in the field of Business Administration, Accounting, Economics, Law or Engineering.
- c. Training Same as Level VI plus Construction Contract Modification Course (CECOS) and Facilities Support Contracting (CECOS).
- d. Duties Majority of time (over 50%) is spent on procurement matters.

(4) LEVEL IV (\$500,000)

- a. Experience Shall have three years of progressively complex Government contract related experience, with at least one year of specialized experience in construction and/or facility support contracting.
- b. Education Same as Level V.
- c. Training Same as Level V plus course in Defense Cost and Price Analysis and Contract Law.
- d. Duties Primary duties (over 75%) are supervising or performing procurement functions.

(5) LEVEL III (\$1,000,000)

- a. Experience Shall have five years of progressively complex Government contracts related experience with at least two years of specialized experience in construction and/or facility support contracting.
- b. Education A Bachelor's degree is highly desirable preferably in Business Administration Accounting, Economics, Law or Engineering.
- c. Training Same as Level IV plus CECOS Design Contract Management Course and Advanced Contract Administration.
- d. Duties Same as Level IV.

(6) LEVEL II (\$5,000,000)

- a. Experience Same as Level III.
- b. Education Same as Level III.
- c. Training Same as Level III plus participation in NAVFAC Executive Institute Levels I-IV, Two-Step Multiyear Procurement.
- d. Duties Same as Level III.

(7) LEVEL I (UNLTD)

- a. Experience Same as Level II.
- b. Education Same as Level II.
- c. Training Same as Level II plus Graduate of NAVFAC Executive Development Program highly desirable. Attend Defense Acquisition and Contracting Executive Seminar.
- d. Duties Same as Level II.

(b) Engineering Field Divisions shall maintain a file documenting the factors considered in determining the level of authority delegated (e.g., prior assignments, procurement training, formal education). A copy of all warrants issued and supporting documentation pertaining to issuing, modifying, and/or terminating warrants shall be forwarded to NAVFACENGCCM (023). EFD's may obtain copies of data on file for reference in making subsequent appointments to transferred personnel.

(c) Through 31 December 1987, appointing authorities may issue warrants to personnel they find qualified but not fully meeting the above criteria if such delegations are necessary for accomplishment of our mission.

1-402.3 Special Delegations

(a) International Balance of Payments Program (Part 25). The Commanders of the Atlantic and Pacific Divisions are authorized to make the determinations required by FAR Part 25 for procurements estimated not to exceed \$100,000. This authority shall be exercised in accordance with the criteria set forth in the FAR. It may be redelegated to deputies and/or the Director of the Contracts Division.

(b) EFD Commanders and Executive Officers are authorized to approve A/E and ES slates and selections having an estimated price between \$500,000 and \$1,000,000. This authority may not be redelegated.

(c) It is not necessary for EFD Commanders and independent CICC's to be warranted. However, they may request that they be warranted. Requests should be forwarded, with supporting qualifications, attention NAVFAC (02).

(d) Professional Engineers may be authorized to chair A/E and ES "Brooks Act" slating and selection boards provided they meet the following qualification criteria:

(1) They must have served as a board member, on the type of board they are being authorized to chair, for at least ten prior actions.

(2) They must have completed the CECCS Design Contract Management course and passed the final exam with a score of at least 80.

(3) They must be briefed and certified by the EFD Contracts Division Director and Counsel as having acceptable knowledge of the authority of Board Chairmen and basic procurement rules and ethics.

(e) Resolution of bid irregularities may be delegated only to field OICC's having NAVFAC Counsel assigned to their offices.

(f) Individuals having Level I or II single source authority may waive CBD synopsis for procurements they or their subordinates authorize on an emergency basis.

(g) Authority to issue contracting officer warrants for levels II through VII to civilian procurement personnel of the EFD and Field Contracts Offices may be delegated by EFD Commanders to the EFD Contracts Division Director.

(h) Field OICC's may nominate qualified individuals to the EFD Commander for appointment as contracting officers. Nominations shall include appropriate supporting justification and qualifications (see FAR 1.6 and 1-402.2).

1-402.4 Limitations on Authority Delegated by Warrants

(a) It shall not be assumed that any authority not specifically covered by a warrant has been delegated.

(b) Much of the authority delegated is subject to prior coordination, review and/or approval of NAVFACENGCOM or the EFD. Those actions requiring prior review and/or approval by NAVFACENGCOM are set forth in various sections throughout this publication and are summarized in Appendix B. All contract action requests requiring approval of NAVFACENGCOM shall be submitted via the EFD. The EFD shall screen requests and not forward those which are inconsistent with sound procurement policies and procedures. All requests for NAVFACENGCOM approval shall be forwarded, "ATTN: 021" unless another code is specifically indicated herein.

(c) Nothing set forth herein shall be construed as authorizing the obligation of funds, or the award of a contract without available authorized funds in an amount to equal the amount of the award, or obligation.

(d) Nothing set forth herein shall be construed as authorizing the review and approval of any action to be awarded on a basis of other than sealed bids, by an individual that participated as a member of the negotiation or selection board for the action involved.

1-403 GUIDELINES FOR DELEGATIONS OF AUTHORITY TO FIELD OICC'S AND THEIR STAFFS

1-403.1

(a) CEC officers assigned as Public Works Officers usually receive orders directing them to report, by letter, to the appropriate Commander "for additional duty as OICC and/or ROICC of NAVFACENGCOM contracts as authorized or assigned." The Commander shall indicate the type and extent of contractual authority assigned to the reporting officer by issuing a warrant pursuant to 1-402. Dependent on the nature of the contracting work at the activity and the personal qualifications of the individual, field OICC's will normally be given Level II-V contracting authority.

(b) Every OICC shall, as soon after reporting as possible, designate a CEC officer or senior civilian to be Assistant OICC. If the designated individual is not warranted, a nomination for warrant should be filed (see 1-402.3(h)). If the OICC is detached by official orders, or is absent because of sickness, authorized leave, or official duties, within the limits of his/her authority, the designated Assistant OICC shall perform as acting OICC until a successor OICC has been assigned or the incumbent has returned. A responsible individual must be available at all times for performance of contract functions.

(c) OICC's shall appoint ROICC's (officers or civilians) as may be necessary to assist in properly administering contracts under their cognizance. For each designation, the OICC, by letter to the appointed ROICC, shall specifically outline the authority and responsibilities of the ROICC. (Copy to the cognizant EFD to retain for record purposes.) The delegation of authority to ROICC may include authority to perform functions that must be performed by warranted contracting officers only to the extent that the ROICC has been warranted to perform such duties.

1-403.2 Property Administration. When government property is furnished to a contractor, the OICC shall appoint a property administrator who shall be responsible for assuring that the government property is maintained and returned or disposed of in accordance with the contract provisions.

1-404 SUPERVISION OF SUBORDINATE ACTIVITIES.

1-404.1 General. Commanders shall supervise and monitor the contractual procedures, performance and staffing of subordinate contracting offices. Procedures and controls considered necessary for effective supervision, should be established by the Head of the Acquisition Department in conjunction with the Directors of the Contracts, Assurance and Contracts Support Divisions.

1-404.2 Staffing and Qualification of Personnel. Commanders are responsible for assuring that EFD's and subordinate activities are adequately staffed by qualified personnel capable of performing the contracting functions assigned. EFD Commanders shall assure that civilian and military personnel warranted as contracting officers receive formal education and training consistent with DOD Manual 1430.10-M-1, that indicated in 1-402.2 and related training programs established by the Command. Individual development plans for all civilian contracting personnel shall be forwarded to the Assistant Commander for Contracts (023D). This information shall be updated as additional training is completed.

1-404.3 Procurement Management Reviews

(a) Procurement Management Reviews (PMR) and inspections of field contracting activities shall be conducted as often as determined necessary by EFD Commanders but in no event less than on a 24 month frequency. Factors such as the complexity and volume of business, known or anticipated problems should be considered in determining the frequency of inspections (See 6-214). An annual report shall present in summary format statistical data by type, number, and dollar value of contracting actions for the offices reviewed. The report as minimum is to address office organization, staffing, training, and pre and post contract award procedures for both formally advertised and negotiated actions.

(b) Procurement management reviews shall include appropriate checks to assure that only warranted contracting officers exercise contracting officer authority and that their actions are consistent with the authority cited in their warrants.

1-405 ACTIVITY COMPETITION ADVOCATES(6.303)

A. Commanders of Engineering Field Divisions and OICC Trident are Activity Competition Advocates with the authority to authorize negotiations and to Execute J&A's for the use of other than full and open competition for proposed urgent contracts over \$100,000 but not exceeding \$1,000,000 under the authority of DFARS 6.302-2. Justifications for such actions will be prepared in NARS 6.303.90 format, retained in the contract file and be made available for public inspection. Approval by the Competition Advocate is authority for a Contracting Officer to execute the contract. This authority may not be redelegated but may be exercised by acting Commanders/Commanding Officers.

B. DFARSUP 6.303-1 requires that recommendations by technical and requirements personnel for other than full and open competition must have been reviewed and approved at an appropriate management level prior to submittal to the Contracting Officer. Within the EFD's that management level is the Department Head for their respective assigned areas of responsibilities. (09A or 09B or 09P)

C. Single source authority (FAR 6.302-1 and par. 1-402.1(16)) is not included in this delegation. Also see FAR 5.202(2) and 1-402.3(f) on waiver of synopsis.

D. For all other purposes, the EFD Contracts Office Director is the Competition Advocate.

1-406 RATIFICATION OF UNAUTHORIZED COMMITMENT (DFARS 1.670.1, NDFARS 1.670-3)

COMNAVFACENGCOM as HCA is authorized to ratify Unauthorized Commitments (UC) in excess of \$25,000. All such requests will contain the documentation required by NDARS 1.670-3 and shall be reviewed by EFD Counsel. Further, in accordance with NDARS 1.670-3, the following delegations for ratifications are made:

<u>Position</u>	<u>Maximum Authority to Ratify UC</u>
EFD Contracts Office Director	\$10,000
EFD Commander/Commanding Officer	\$25,000

APPENDIX D

CONSTRUCTION-CONTRACT-ADMINISTRATION-AND-MANAGEMENT COURSE TOPICS

1. Overview of NAVFAC Contracting
2. Acquisition Planning
3. Contract Funding
4. Design Management
5. Small Purchase
6. Sealed Bidding
7. Contracting by Negotiation
8. Contract Administration
9. Contract Clauses
10. Construction Quality Assurance
11. Construction Safety
12. Labor Laws
13. Construction Material
14. Payments
15. Completion
16. Interpretation and Disputes
17. Schedules
18. Contract Modifications
19. Price Negotiation
20. Cost Principles
21. Time Extension Workshop
22. Pricing Workshop
23. Negotiation Techniques

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